TECHNICAL INFORMATION REPORT

For

Teunissen Short Plat
23121 SE 49th CT
Issaquah WA, 98029

March 23, 2021

03/23/2021
Prepared by:
Ian Dahl

Encompass Engineering Job No. 20636

Prepared For:

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Appendix A

Stormwater Management Report by Mead & Hunt dated August 7, 2015, including:

- Geotechnical Engineering Study by Geo Group Northwest, Inc. dated December 31, 2014
- Final Critical Areas Study for Jazz Run Subdivision by Altmann Oliver Associates, LLC dated July 29, 2015
- WWHM2012 Output
- Operation and Maintenance Manual

I. PROJECT OVERVIEW

Project: Teunissen Short Plat
Site Address: 23121 SE 49th Ct Issaquah, WA 98029
King County Tax Parcel: 222406-9126
Site Area: 25,733 SF (0.59 AC)
Zoning District: SF-SL – Single Family Small Lot – 7.26 DU/Acre

Figure 1: Vicinity Map

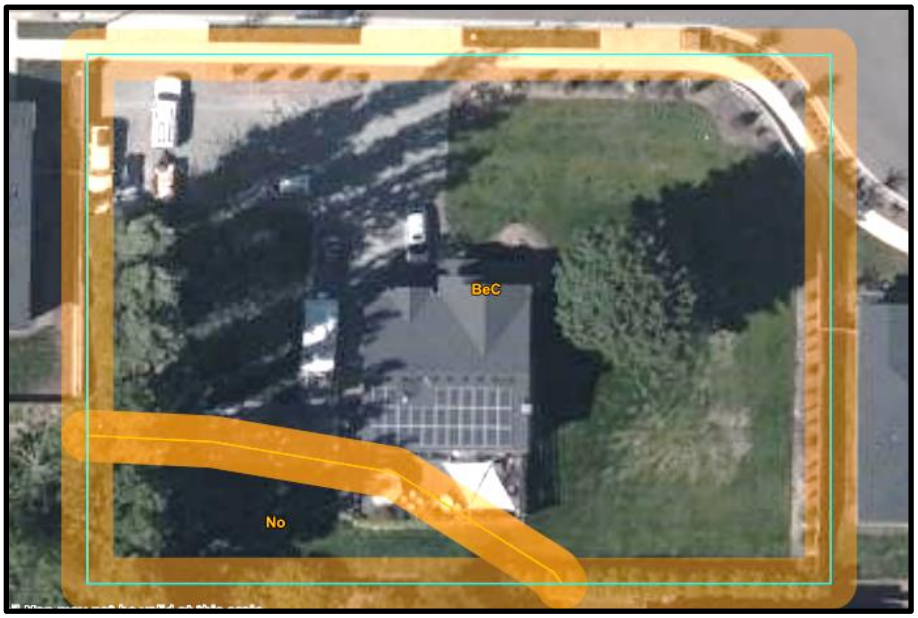
The proposed project is located on the south side of SE 49th Ct in the City of Issaquah. The 25,733 SF (0.59 AC) site contains an existing single-family residence with a gravel driveway connecting to SE 49th Ct that is surrounded by grass lawn and sparse trees. The majority of the site slopes to the south at 2-15%, with a small portion of the site in the northeast corner sloping to the east at around 2%. The site is bordered to the east and west by single-family residences, to the north by the SE 49th Ct right-of-way, and to the south by undeveloped wetland area. The parcel is contained within the Jazz Run Subdivision approved in 2015, which created 19 new lots on SE 49th Ct and 230 Pl, and included the stormwater mitigation for three future lots within the project site. Storm drainage design for the Jazz Run Subdivision assumed 50% of the three future lots as impervious area, the maximum per SF-SL zoning. A stormwater detention vault followed by a single filter vault located to the west of the project site was sized to meet both flow control and water quality requirements from these proposed impervious areas. Runoff from two future residences on Lots 1 & 3 will be conveyed to this system, while the roof area from the existing house on Lot 2 will maintain its current drainage patterns and be conveyed to an existing dispersion trench to the south of the residence. The reminder of pervious areas on the project site were designed to disperse to the south into the wetland area. The approved Stormwater Management Report for the Jazz Run Subdivision is included as Appendix A of this report.

II. EXISTING CONDITIONS SUMMARY AND SITE ANALYSIS

The existing and proposed site conditions are described in detail below:

Existing Conditions:
The project is located in the City of Issaquah on a 25,733 SF (0.59 AC) lot that is zoned as residential SF-SL Single Family Small Lot (7.26 DU/Acre). The property contains an existing single-family residence with a gravel driveway connecting to SE 49th Ct that is surrounded by grass lawn and sparse trees. The majority of the site slopes to the south at 2-15%, with a small portion of the site in the northeast corner sloping to the east at around 2%. The parcel is contained within the Jazz Run Subdivision approved in 2015, which created 19 new lots on SE 49th Ct and 230 Pl, and included the stormwater mitigation for three future lots within the project site. A Geotechnical Engineering Study prepared by GEO Group Northwest and a Final Critical Areas Study for Jazz Run Subdivision by Altmann Oliver Associates, LLC were prepared for the original Jazz Run Subdivision and are included in the approved Stormwater Management Report by Mead & Hunt dated August 7, 2015. An Existing Conditions Map is included on the following page.

The soils on site have been classified by the United States Geological Survey (USGS) Web Soils Survey as Beausite gravelly sandy loam, 6 to 15 percent slopes, with a portion of the site in the southeast corner classified as Norma Sandy Loam (see Figure 2 below). The Geotechnical Engineering Study by GEO Group Northwest indicates an upper layer of silty sand/sandy silt, underlain with silty sandstone bedrock that was found in test pits and boring logs adjacent to the site. These soil conditions, in addition to the discovery of shallow ground water do not allow for the infiltration of stormwater.



Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BeC	Beausite gravelly sandy loam, 6 to 15 percent slopes	0.5	87.1%
No	Norma sandy loam	0.1	12.9%
Totals for Area of Interest		**0.6**	**100.0%**

Figure 2: Soils Map and Legend

Proposed Conditions:
The project proposes the development of three single-family lots within the 25,733 SF (0.59 AC) parcel, all with driveway access off of SE 49th Ct. Lot 1 is 8,697 SF (0.20 Acres) and is located along the eastern portion of the site. Lot 2 is 8,681 SF (0.20 Acres), is located in the central portion of the site, and includes the retention of the exiting residence. Lot 3 is 8,355 SF (0.19 Acres) and is located in the western portion of the site. A Developed Conditions Map is provided as Figure 5 at this end of this Section.

The parcel is zoned SF-SL – Single Family Small Lot, which allows for a maximum impervious surface coverage of 50%. The maximum allowable impervious surface for each lot is discussed below:

- **Lot 1:** The maximum impervious surface coverage is 8,697 SF*0.50 = 4,349 SF. The final site layout of Lot 1 has not been determined at this stage; therefore, this report assumes that the future impervious surfaces required to construct the residence on Lot 1 will use the maximum coverages stated above.
- **Lot 2:** The maximum impervious surface coverage is 8,681 SF*0.50 = 4,341 SF. The final site layout of Lot 2 has not been determined at this stage; although the 1,850 SF residence will be retained and the gravel driveway will be converted into a paved driveway. This report assumes that the future impervious surfaces on Lot 2 will use the maximum coverages stated above.
- **Lot 3:** The maximum impervious surface coverage is 8,355 SF*0.50 = 4,178 SF. The final site layout of Lot 3 has not been determined at this stage; therefore, this report assumes that the future impervious surfaces required to construct the residence on Lot 3 will use the maximum coverages stated above.

Stormwater runoff from the proposed development of Lots 1-3 will be managed as follows:

- **Lot 1 & 3:** Stormwater from the total 8,527 SF of impervious area from these lots will be conveyed to the existing storm system on SE 49th Ct with the use of existing stubs installed with the Jazz Run Subdivision. Stormwater will be conveyed to the existing detention vault located on the stormwater detention tract to the west of the project site. Pervious areas will sheet flow disperse to the south, towards the adjacent wetland.
- **Lot 2:** Stormwater from the existing rooftop area on this lot will continue to drain to an existing dispersion trench located to the south of the residence.

Site Analysis Conditions:
This project proposes to meet the requirements detailed in the 2014 Washington State Department of Ecology Stormwater Manual for Western Washington (SMMWW) and the City of Issaquah 2017 Stormwater Design Manual Addendum. Per Figure 2.3 of the City of Issaquah Addendum (shown as Figure 3 on the following pages), all minimum requirements apply to the new and replaced hard surfaces and converted vegetation areas on site. A summary of the minimum requirements is provided on the following page:

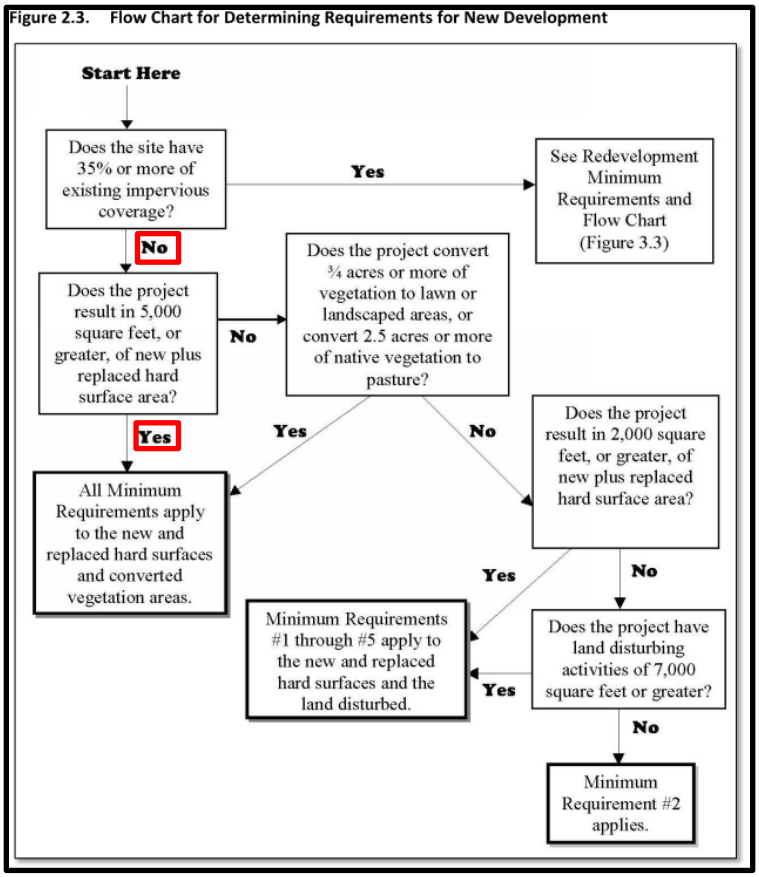


Figure 3: Drainage Review Flow

Minimum Requirement #1: Preparation of Stormwater Site Plans

This Technical Information Report (TIR) has been prepared to satisfy Minimum Requirement #1.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (CSWPPP)

A CSWPPP is not required as the site is under one acre. However, a Temporary Erosion and Sediment Control (TESC) Report and Stormwater Pollution Prevention Plan For Construction Activities has been prepared for this project and submitted under separate cover.

Minimum Requirement #3: Source Control of Pollution

Pollutant source control is not applicable to this project.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Runoff from the proposed development will follow existing drainage patterns. The majority of the stormwater runoff from the site discharges to the wetland to the south of the site in one Natural Discharge Area (NDA), while a small portion in the northeastern corner of the site sheet flows off-site to the east, creating a separate NDA. The eastern NDA enters the existing storm system in the cul-de-sac of SE 49th Ct, and converges with stormwater from the western NDA in the wetland south of the project site in under ¼ of a mile, creating a single Threshold Discharge Area (TDA) for the site. In the developed condition, impervious areas will be conveyed to a detention vault, which discharges to the wetland. Pervious areas will disperse to the south into the wetland. A small lawn area encompassing the eastern NDA will continue

to follow natural drainage patterns and sheet flow to the east entering the storm system on SE 49th Ct. See Offsite Analysis in Section III of this TIR for more details on the drainage patterns of the site.

Minimum Requirement #5: On-Site Stormwater Management

List #2 in Section 2.4.5 of the Issaquah Addendum was used to select on-site stormwater BMPs for projects triggering Minimum Requirements #1 through #9. See Section IV of this TIR for more information on how these facilities were selected and sized.

Minimum Requirement #6: Runoff Treatment

Water quality treatment for this project will be provided by the existing Kristar Perk single filter vault located downstream of detention and sized based on the 2-year detention release rate from the detention facility. This single filter vault meets the phosphorus removal and Enhanced Treatment requirements as specified in the City of Issaquah 2017 Stormwater Design Manual Addendum.

Minimum Requirement #7: Flow Control

Flow control for impervious area runoff on the project site, excluding existing improvements on Lot 2, will be provided by an existing detention vault located on the stormwater detention tract to the west of the site. Pervious areas will be sheet flow dispersed to the south towards the wetland.

Minimum Requirement #8: Wetlands Protection

Hydrologic impacts to adjacent wetlands have been analyzed and were determined to be non-significant and non-detrimental. Results of the analysis and a copy of the project Critical Areas Report are included in Appendix A.

Minimum Requirement #9: Operations and Maintenance

An Operation and Maintenance Manual is included as a part of the Jazz Run Subdivision Stormwater Management Report Included as Appendix A.

III. OFF-SITE ANALYSIS

An offsite analysis was performed for the Jazz Run Subdivision as a part of the Stormwater Management Report by Mead & Hunt dated August 7, 2015, included as Appendix A. This offsite analysis included the area encompassed by the project site. See Section 3 of Appendix A for more details.

IV. PERMANENT STORMWATER CONTROL PLAN

The project proposes the development of three single-family lots within the 25,733 SF (0.59 AC) parcel, all with driveway access off of SE 49th Ct. The final site layouts of each lot have not been determined at this stage; therefore, this report assumes that the future impervious surfaces will use the maximum coverages per SF-SL zoning (50%). Lot 1 is 8,697 SF (0.20 Acres) and is located along the eastern portion of the site and contains a maximum of 4,349 SF of impervious surfaces. Lot 2 is 8,681 SF (0.20 Acres) and is located in the central portion of the site and contains a maximum of 4,341 SF of impervious surfaces, including the retention of the existing residence. Lot 3 is 8,355 SF (0.19 Acres) and is located in the western portion of the site and contains a maximum of 4,178 SF of impervious surfaces.

Stormwater from impervious surfaces such as rooftop, driveway and walkway areas on Lots 1 & 3 will be conveyed to the existing storm system on SE 49th Ct. Storm cleanouts have been installed on the northern limits of the lots as a part of the Jazz Run Subdivision. The existing residence on Lot 2 will maintain its current drainage patterns and convey rooftop runoff to a dispersion trench located to the south of the residence. The storm system in SE 49th Ct conveys runoff to the existing detention vault located on the stormwater detention tract to the west of the project site. Water quality is provided after detention by the existing Kistar Perk single filter vault. Stormwater from the water quality treatment vault is then conveyed to a dispersal system within the wetland buffer to the southwest of the project site and discharged. Full Level 2 duration control standards were used to calculate detention volumes for the West Basin, which includes impervious areas from the 3 future lots contained in this project. Runoff durations for the developed conditions match the pre-developed durations for storm flow rates from 50% of the 2-year peak rate up to the 50-year peak rate, assuming historic forested conditions and existing impervious surfacing that will be replaced for the calculated pre-developed rates. Water quality treatment is sized based on the 2-year detention release rate from the detention facility. This single filter vault meets the phosphorus removal and Enhanced Treatment requirements as specified in the City of Issaquah 2017 Stormwater Design Manual Addendum. See the complete Jazz Run Subdivision Stormwater Management Report, Included as Appendix A.

List #2 in Section 2.4.5 of the Issaquah Addendum was used to select on-site stormwater BMPs for projects triggering Minimum Requirements #1 through #9. The selection of BMPs for each surface is summarized below:

Lawn and Landscaped Areas:
Lawn and Landscaped Areas will be controlled using Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V of the SWMMMWW.

Roofs:
BMPs for rooftop areas were not considered as the entirety of the rooftop runoff will be conveyed to the existing detention and water quality vaults constructed as part of the Jazz Run Subdivision.

Other Hard Surfaces:
BMPs for other hard surface areas were not considered as the entirety of hard surfaces on the project site will be conveyed to the existing detention and water quality vaults constructed as part of the Jazz Run Subdivision.

V. CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A CSWPPP is not required as the site is under one acre. However, a Temporary Erosion and Sediment Control (TESC) Report and Stormwater Pollution Prevention Plan for Construction Activities has been prepared for this project and submitted under separate cover.

VI. SPECIAL REPORTS AND STUDIES

- Geotechnical Engineering Study by Geo Group Northwest, Inc. dated December 31, 2014
- Final Critical Areas Study for Jazz Run Subdivision by Altmann Oliver Associates, LLC dated July 29, 2015

VII. OTHER PERMITS

- Building permits

VIII. OPERATION AND MAINTENANCE MANUAL

An Operation and Maintenance Manual is included as a part of the Jazz Run Subdivision Stormwater Management Report Included as Appendix A.

IX. DECLARATION OF COVENANT OR EASEMENT FOR PRIVATELY MAINTAINED FLOW CONTROL AND TREATMENT FACILITIES

This document will be prepared and submitted upon plan approval if required.

X. DECLARATION OF COVENANT OR EASEMENT FOR ON-SITE STORMWATER MANAGEMENT FACILITIES

This document will be prepared and submitted upon plan approval if required.

XI. BOND QUANTITIES WORKSHEET

This document will be prepared and submitted if required.

Appendix A

Stormwater Management Report by Mead & Hunt dated August 7, 2015 including:

- Geotechnical Engineering Study by Geo Group Northwest, Inc. dated December 31, 2014
- Final Critical Areas Study for Jazz Run Subdivision by Altmann Oliver Associates, LLC dated July 29, 2015
- WWHM2012 Output
- Operation and Maintenance Manual

Stormwater Management Report

Summit Homes of Washington, LLC

Jazz Run Subdivision Construction Permit

Report prepared by

Mead & Hunt

Revised August 7, 2015

STORMWATER MANAGEMENT REPORT
JAZZ RUN SUBDIVISION

SUMMIT HOMES OF WASHINGTON, LLC
CITY OF ISSAQUAH, WASHINGTON

CERTIFICATE OF ENGINEER

The technical information and data contained in this report was prepared under the direct supervision of the Professional Engineer, whose seal to practice in the State of Washington as such, is affixed above.

Prepared by:
Mead & Hunt, Inc.
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Issaquah, WA 98027
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425-369-9004

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1. Project Overview

Jazz Run (Project) preliminary subdivision, as shown on **Figure 1.1 – Site Location**, is a proposed 19-lot single-family residential subdivision on three parcels (6.82 acres total area) located on the south side of SE 48th Street. The Project is located at approximately 23023 SE 48th Street in the city of Issaquah (City).

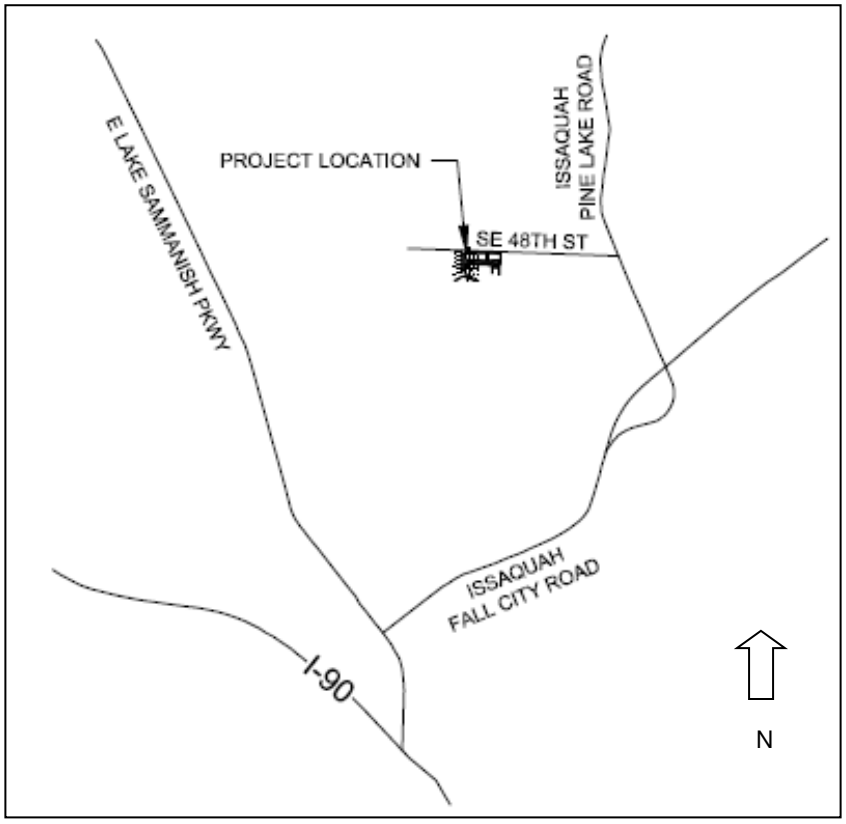


Figure 1.1 – Site Location

The parcels (APN 222406-9098, -9126, and -9048) are currently developed with single-family residences. Approximately 2.3 acres of parcel -9098 has been designated as wetland and wetland buffer (see Sheet C-100 of the construction drawings set). Approximately 0.6 acres of parcel -9126 will be split off and separated from the project using the City's Lot Line Adjustment process. However, this report addresses flow control and water quality treatment mitigation for the Teunissen Remainder parcel as if it were to be short platted into three lots as part of the Jazz Run subdivision. The proposed subdivision (not including Teunissen) will add 19 single-family residential lots, approximately 355 feet of new roadway within the plat interior (along with curb, gutter, and sidewalk), widen SE 48th Street by 6 feet, and add curb, gutter, and sidewalk in SE 48th Street along the project frontage.

Utilities will be installed to serve the new improvements, including sanitary sewer, water mains, power, gas, and communications. Storm drainage collection, treatment, and flow control systems will also be constructed to serve new impervious areas.

Runoff from the project discharges to two separate threshold discharge areas (TDAs). Runoff from the western portion of the site flows to the Lower Issaquah Creek basin to the west, eventually reaching Issaquah Creek in the vicinity of East Lake Sammamish Parkway. Runoff from the eastern portion of the site flows to the east into the Laughing Jacobs Creek basin and eventually reaches Lake Sammamish. The basins are considered to be separate TDAs because the nearest point of convergence downstream from the project site is greater than ¼ mile. Runoff to both basins requires phosphorus removal for water quality treatment because all runoff eventually reaches Lake Sammamish. However, new PGIS in the East basin will be less than 5,000 sf so that WQ treatment is not required for that TDA.

In the Western TDA, the project will result in 1.2 acres of new impervious surfacing. This exceeds the threshold of 5,000 square feet (sf) so that "Level 2" (Conservation) flow control will be required. Per City of Issaquah addendum to the 2009 King County Surface Water Design Manual, the existing conditions are the *historic pre-developed condition except for existing impervious surface pre-developed condition*.

The west basin area discharges directly to an existing wetland within the boundary of the project. That wetland contains low-quality vegetation that is not sensitive to fluctuations in water level, and recent projects in the area have constructed a high level flow bypass within the wetland. That bypass carries flow from the wetland down to the valley floor.

The Eastern TDA basin discharges to a roadside ditch along the edge of a wetland. That ditch is ponded with water during the winter. About 0.5 acres of new impervious will be added to this basin. However, the increase in the 100-year event will be less than 0.10 cfs so that flow control is not required.

This report is being prepared for submittal to the City for the project Site Work Permit application for construction of plat infrastructure improvements. Flow control and water quality calculations have been prepared using WWHM 2012 software program, which utilizes the HSPF method for runoff determination.

A Notice of Intent (NOI) will be sent to Washington State Department of Ecology (WSDOE) prior to construction to obtain coverage under the state's General Permit for construction site stormwater discharges because more than 1 acre of earth will be disturbed.

2. Preliminary Conditions Summary

Stormwater management requirements for this project are based on the 2009 King County Surface Water Design Manual as amended by the City. The City has also adopted Volume IV of the 2005 Department of Ecology Stormwater Management Manual for Western Washington. **Exhibits 4.1** and **4.2**, at the back of Section 4 of this report, show the existing and developed conditions basin maps including sub-basin delineation and discharge points from each basin. The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) soils mapping for the area is shown in **Figure 2.1 – NRCS Soil Map,** below. Their survey indicates that most of the soils consist of No (Norma sandy loam) and BeC (Beausite gravelly sandy loam).

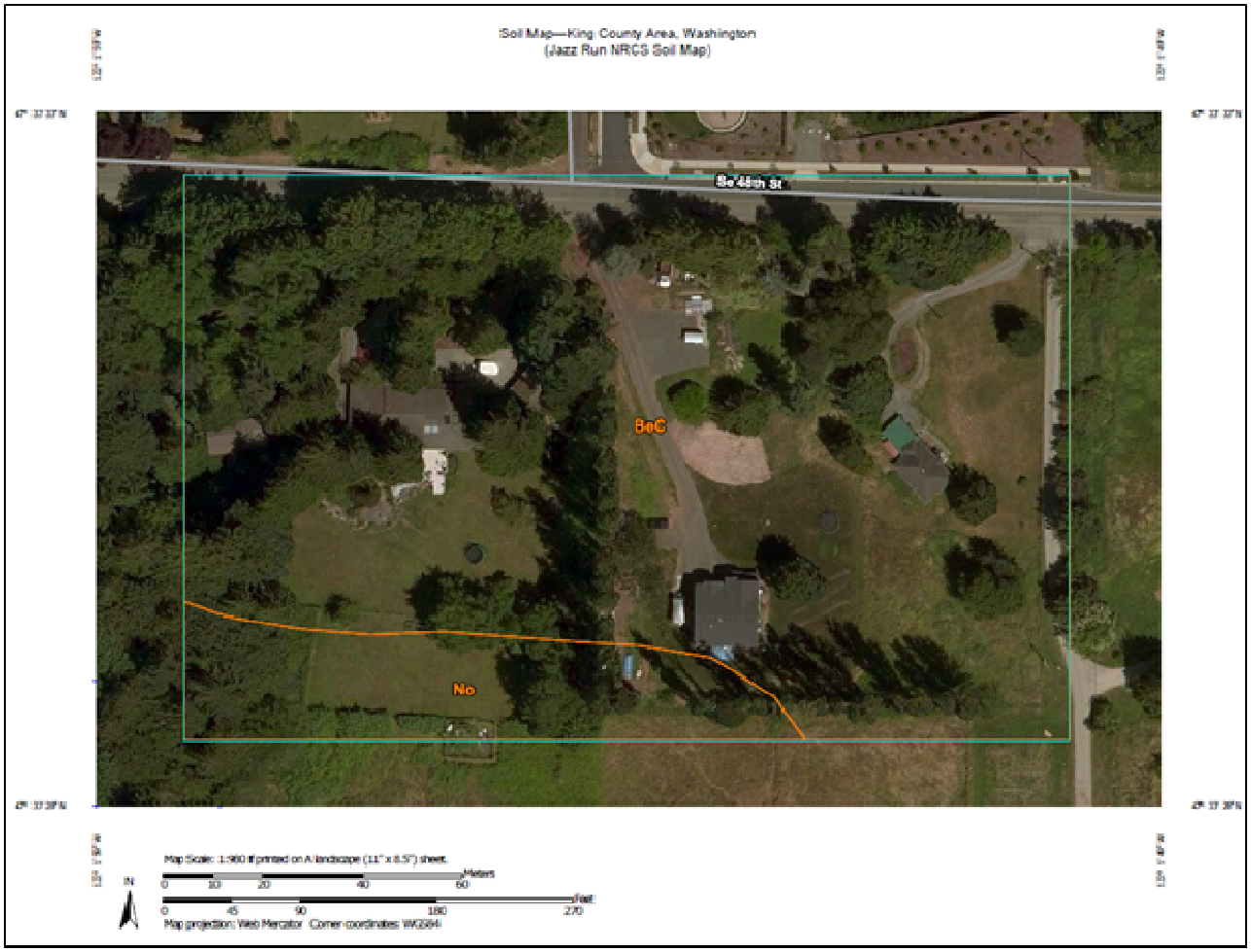


Figure 2.1 – NRCS Soil Map

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner:
Summit Homes of Washington, LLC
Phone: 253-854-0415
Address: 16000 Christensen Road
Tukwila, WA 98188
Project Engineer: Mr. Donald Proctor, P.E.
Company: Mead & Hunt, Inc.
Phone: 425-507-1991

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name:
Jazz Run
DDES Permit # _____
Location Township: 24 N
Range: 6 E
Section: 22
Site Address: 23023 SE 48th Street
_____

Part 3 TYPE OF PERMIT APPLICATION

☒ Landuse Services
Subdivision / Short Subd. / UPD
❑ Building Services
M/F / Commercial / SFR
☒ Clearing and Grading
☒ Right-of-Way Use
❑ Other _____

Part 4 OTHER REVIEWS AND PERMITS

❑ DFW HPA
❑ COE 404
❑ DOE Dam Safety
❑ FEMA Floodplain
❑ COE Wetlands
❑ Other _____
❑ Shoreline Management
❑ Structural Rockery/Vault/_____
❑ ESA Section 7

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report		**Site Improvement Plan (Engr. Plans)**	
Type of Drainage Review	**Full** / Targeted / Large Site	Type (circle one):	**Full** / Modified / Small Site
Date (include revision dates):	**May 2015** _____	Date (include revision dates):	**May 2015** _____
Date of Final:	_____	Date of Final:	_____

Part 6 ADJUSTMENT APPROVALS

Type (circle one): Standard / Complex / Preapplication / Experimental / Blanket
Description: (include conditions in TIR Section 2)
_____
_____
_____

Date of Approval: _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS

Monitoring Required: **Yes**

Start Date: **TBD**

Completion Date: _____

Describe: Monitor at two outfall locations as shown in on the Erosion Control Plan Sheet C-110

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan: **Not applicable**
Special District Overlays:
_____

Drainage Basin: **Lower Issaquah Creek (ELS Tributary Basin), Laughing Jacobs Creek**
Stormwater Requirements: **Phosphorus Control Water Quality, Level 2 Flow Control**

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

- ❑ River/Stream _____
- ❑ Lake _____
- ☒ Wetlands _____
- ❑ Closed Depression _____
- ❑ Floodplain _____
- ❑ Other _____
- ❑ Steep Slope _____
- ❑ Erosion Hazard _____
- ❑ Landslide Hazard _____
- ❑ Coal Mine Hazard _____
- ❑ Seismic Hazard _____
- ❑ Habitat Protection _____
- ❑ _____

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
Beausite gravelly sandy loam	1-25%	moderate
Norma Sandy Loam	1-25%	moderate

- ☒ High Groundwater Table (within 5 feet)
- ❑ Other _____
- ❑ Sole Source Aquifer
- ❑ Seeps/Springs

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

❑ Additional Sheets Attached

Part 11 DRAINAGE DESIGN LIMITATIONS	
REFERENCE	LIMITATION / SITE CONSTRAINT
☒ Core 2 – Offsite Analysis	
☒ Sensitive/Critical reas	
☒ SEPA	
☒ Other: Erosion control/drainage	
❑	
❑ Additional Sheets Attached	

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
Threshold Discharge Area: West Basin (to ELS)/East Basin to Laughing Jacobs	
Core Requirements (all 8 apply)	
Discharge at Natural Location	Number of Natural Discharge Locations: 1 West 1 East
Offsite Analysis	Level: **1** / 2 / 3 dated: Dec. 2014
Flow Control (incl. facility summary sheet)	Level: 1 / **2** / 3 **East Basin Exception (<0.10 cfs)** Small Site BMPs
Conveyance System	Spill containment located at: **detention vault (West Basin)**
Erosion and Sediment Control	ESC Site Supervisor: **TBD** Contact Phone: After Hours Phone:
Maintenance and Operation	Responsibility: Private / **Public** If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: **Yes** / No
Water Quality (include facility summary sheet)	Type: Basic / **Sens. Lake** / Enhanced Basic / Bog **West Basin only, East Basin threshold not met** Landscape Management Plan: Yes / No
Special Requirements (as applicable)	
Area Specific Drainage Requirements	Type: CDA / SDO / MDP /BP / LMP / Shared Fac. / **None** Name:
Floodplain/Floodway Delineation	Type: Major / Minor / Exemption / **None**: 100-year Base Flood Elevation (or range): Datum:

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Flood Protection Facilities	Describe:
Source Control (comm./industrial land use)	Describe landuse: **SFR** Describe any structural controls: **none**
Oil Control	High-use Site: Yes / **No** Treatment BMP: _____ Maintenance Agreement: Yes / **No** with whom? _____
Other Drainage Structures	
Describe:	

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☒ Clearing Limits	☒ Stabilize Exposed Surfaces
☒ Cover Measures	☒ Remove and Restore Temporary ESC Facilities
☒ Perimeter Protection	☒ Clean and Remove All Silt and Debris, Ensure Operation of Permanent Facilities
☒ Traffic Area Stabilization	☒ Flag Limits of SAO and open space preservation areas
☒ Sediment Retention	❑ Other _____
☒ Surface Water Collection	
☒ Dewatering Control	
☒ Dust Control	
☒ Flow Control	

Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)

Flow Control	Type/Description	Water Quality	Type/Description
☒ Detention	vault_____	❑ Biofiltration	_____
❑ Infiltration	_____	❑ Wetpool	_____
❑ Regional Facility	_____	☒ Media Filtration	Kristar Perkfilter_____
❑ Shared Facility	_____	❑ Oil Control	_____
☒ Flow Control BMPs	dispersion_____	☒ Spill Control	Tee in Vault_____
❑ Other	_____	❑ Flow Control BMPs	_____
		❑ Other	_____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 15 EASEMENTS AND TRACTS		Part 16 STRUCTURAL ANALYSIS
☒ Drainage Easement ❑ Covenant ☒ Native Growth Protection Covenant ☒ Tract ❑ Other		☒ Cast in Place Vault ❑ Retaining Wall ❑ Rockery > 4' High ❑ Structural on Steep Slope ❑ Other

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER
I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provide here is accurate. *Signed/Date*

A. Core Requirements

Following is a list of the eight core requirements and a description of how each requirement will be met.

(1) Discharge at the Natural Location

Surface and stormwater runoff from the project site discharges at two locations. Runoff from basin West discharges to the wetland along the southwest edge of the site. Runoff from basin East discharges along an existing swale that flows east. Surface and stormwater runoff from the developed site will discharge to the same locations as existing.

(2) Offsite Analysis

A Level 1 downstream analysis has been performed for each downstream flow path and is included as Section 3 of this report. The analysis did not discover any information or conditions that would result in more stringent requirements for flow control and water quality treatment. The City has received and approved several applications for subdivisions on properties adjacent to the Jazz Run project so that the downstream flow path conditions are well understood. An existing culvert that discharges water from the SE 48th Street right-of-way into the site will be conveyed through the site and around the new detention system. Runoff from the south half of the SE 48th Street roadway will be collected along with runoff from the widened roadway and new sidewalk, and accommodated for within the proposed flow control and water quality treatment facilities.

(3) Flow Control

TDA 1 (West Basin): City of Issaquah Level 2 Flow Control is required for this basin because greater than 5,000 sf of effective impervious surface will be created or replaced. In addition, 1.04 acres of forested land will be converted to pervious lawn and landscaping. Soil investigations have indicated that the existing site soils contain a significant amount of silt and are not feasible for infiltration flow control.

Flow control will be provided for this basin by dispersing rear yards and roofs drains as much as is practical into vegetated areas prior to reaching the wetlands. Non-dispersed areas will be collected and conveyed to a detention vault located in Tract A.

TDA 2 (East Basin): Flow Control is not required for this basin because the 100-year peak flow rate for the developed condition will not be greater than 0.10 cfs more than for the existing condition.

(4) Conveyance System

New conveyance pipes will be designed to accommodate at minimum the 25-year peak flow rate. The overflow from a 100-year event will not create or aggravate a severe flooding problem or severe erosion problem. The 100-year event will overflow along the public right-of-way. Backwater analysis including the 25 and 100-year peak runoff events (rational method) are included in Section 6 of this report.

(5) Erosion and Sediment Control

An erosion and sediment control plan and a Construction Stormwater Pollution Prevention Plan (CSWPPP) have been prepared for the project and are included in the Site Work Permit application documents to be reviewed by the City of Issaquah. Both of those documents will become the responsibility of the selected general contractor during construction for implementation, monitoring, maintenance, and enhancement as required to meet WSDOE and City requirements. An NPDES permit and turbidity monitoring will be required. A Notice of Intent has already been filed with WSDOE for this project and public notices have been given in accordance with the permit requirements.

(6) Maintenance and Operations

A maintenance and operation manual has been prepared for this project and is included as part of this report. The City will assume responsibility for maintenance and operation of the stormwater facilities.

(7) Financial Guarantees and Liability

Bond quantities and financial guarantees will be provided by the Developer at the time of construction plan review by the City.

(8) Water Quality

Sensitive lake water quality treatment mitigation must be provided for this project because runoff from the West Basin and East Basin eventually flow into Lake Sammamish. Kristar Perk Filters have a General Use Level Designation (GULD) from WSDOE to be used for meeting phosphorus removal requirements (Sensitive Lake treatment criteria). A single filter vault will be used to treat runoff after release from the detention vault within the West Basin. Sizing for that facility is based on the 2-yr detention vault release rate. Water quality treatment is not required for the East Basin because less than 5,000 sf of new pollution generative impervious surface will be added there.

B. Special Requirements

Hydrologic impacts to adjacent wetlands have been analyzed in coordination with the project biologist (John Altman) and determined to be non-significant and non-detrimental. Results of the analysis and a copy of the project Critical Areas Report are included in Section 7 of this report.

3. Offsite Analysis

The project site lies over a ridge line between two major drainage basins. The West Basin discharges to the west within the Lower Issaquah Creek regional basin. The East Basin discharges to the east within the Laughing Jacobs Creek regional basin. A Level 1 Downstream Analysis has been performed in accordance with the King County Surface Water Design Manual requirements, including definition of the study area, review of resources, and a visual qualitative inspection of the downstream drainage paths.

A. Upstream Analysis

A portion of the SE 48th Street right-of-way drains directly onto the site through a piped conveyance system. The extent of the contributing area is estimated to be about 1.1 acres and is shown on **Exhibit 3.1 – Upstream Basin Map** which is included at the end of this section. The culvert discharges to the northwest corner of the site and flows through a mild ravine at about 5% slope (through the site) until reaching the wetland buffer and wetland to the south (also on site). For the developed conditions, a catch basin will be constructed over the existing pipe at a location that will also be the low point for the new curb to be constructed there. From the new catch basin, flows will be conveyed separate from other plat drainage, bypassing treatment and detention, and connected to the new West Basin outfall dispersal trench system in the wetland buffer.

B. Downstream Analysis

(1) West Basin

Stormwater leaves the West Basin, as shown on **Exhibit 4.1 - Existing Conditions Basin Map**, at the south end of the project area by sheet and shallow flow entering into the buffer of Wetland A at an approximate elevation of 415.0. Surface water enters the existing wetland and flows to the south, reaching the main body of the existing wetland. The downstream flow path for this basin is shown for approximately 1/4 mile on **Exhibit 3.2**, at the back of this section. Individual reaches shown on that map are as follows:

1. 265′ sheet/shallow ~5.2% South wetland buffer and wetland
2. 590′ SW <1% wetland SW
3. 115′ 12″ cmp culvert SW
4. 350′ 10% 2′ wide stream channel class 3 stream Issaquah 22

(2) East Basin

Stormwater leaves the project area (as shown in **Exhibit 4.1**) from the SE 48th Street right-of-way by culvert and discharges into an existing ditch located in the parcel to the east. Surface water from the main project site sheet and shallow flows to the east onto an existing gravel road that slopes to the northeast before entering an existing ditch along the east side of the existing dirt road. The downstream flow path for this basin is shown for approximately 1/4 mile on **Exhibit 3.3**, at the back of this section. Individual reaches shown on that map are as follows:

1. 50′ sheet across and down gravel road NE
2. 55′ ditch <1% NE
3. 195′ ditch E along south side of 48th <1% along edge of wetland

4. 105′ ditch SE <1% through wetland
5. 62′ culvert SE <1% passes underneath driveway to CB in private property
6. 94′ pipe E from CB to ditch on other side of driveway
7. 30′ ditch in wetland E <1%
8. 26′ culvert under driveway E <1%
9. 475′ wetland shallow flow NE
10. 90′ 18" concrete culvert to north side of 48th
11. 315′ grass swale between 48th and storm pond flow E to culvert underneath pond access road.

C. Resource Review

King County online GIS (iMAP) and City of Issaquah mapping were reviewed. Following are results and discussion of findings:

(1) Landslide, Seismic, and Erosion

The King County iMAP resource indicates erosion potential in the West Basin downstream at less than ½ mile from the project area and a seismic hazard beyond that. There are no other critical area limitations identified in iMAP for either downstream flow path except as indicated below.

(2) Floodplain

The site is not located within the 100-year floodplain.

(3) Groundwater Protection

The Project site lies within the City of Issaquah mapped Class 3 Critical Aquifer Recharge Area.

(4) Wetland

Runoff from the West Basin discharges to a mapped wetland. Runoff from the East Basin travels through several wetlands including flow through a wetland on the adjacent property, a second wetland on the property to the east of that, and then through a third wetland located on the east side of Issaquah-Pine Lake Road SE.

(5) Drainage Complaints

There are no recent (within the last 10 years) complaints regarding drainage/conveyance issues downstream of the West Basin. There is one recent complaint downstream of the East Basin. That complaint was due to beaver activity, causing Klahanie area ponds to plug and go into overflow mode prematurely.

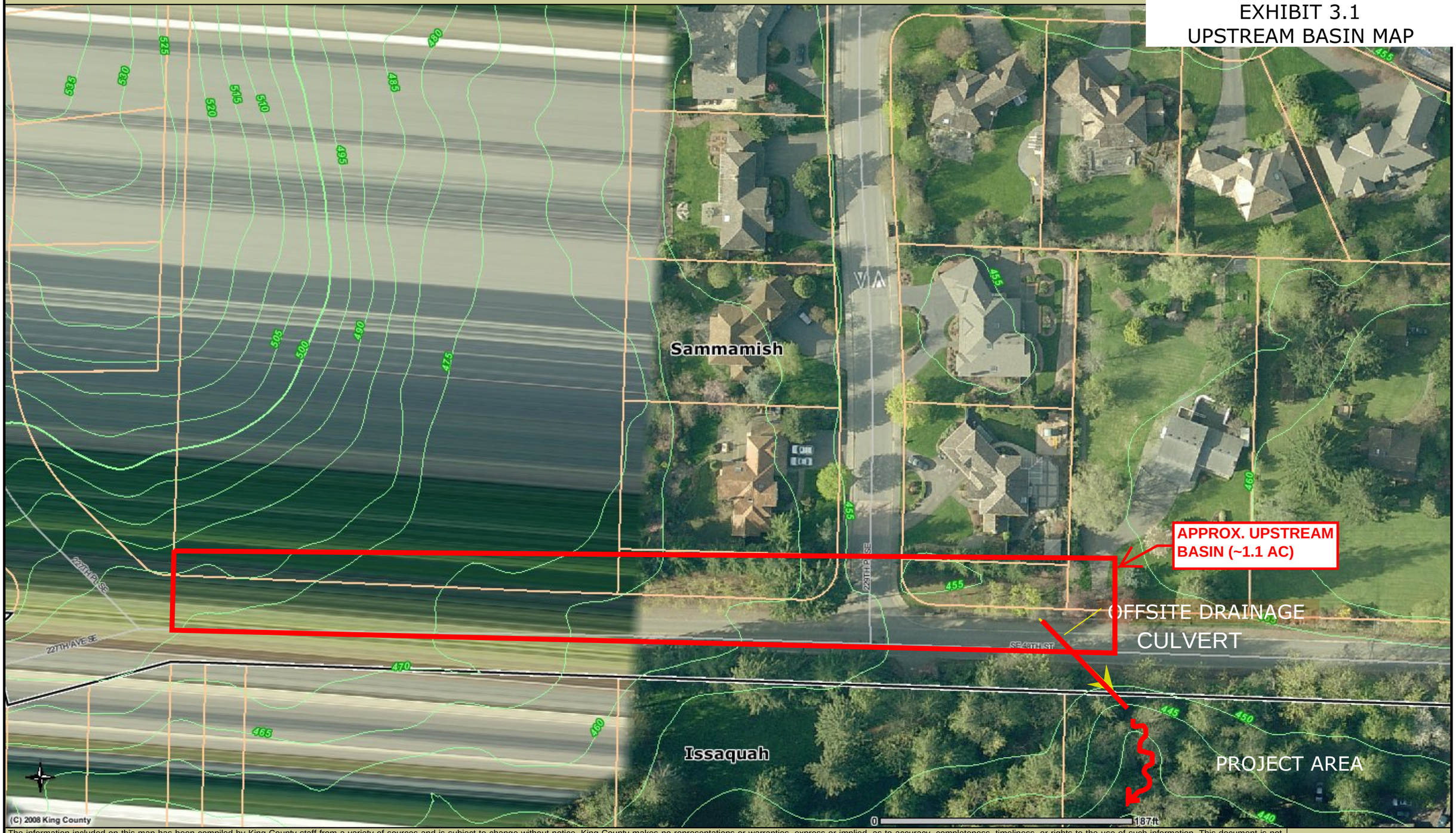
King County mapping is included as **Exhibit 3.4** at the end of this section. The City of Issaquah Critical Aquifer Recharge Area (CARA) map is included as **Exhibit 3.5** at the end of this section.

From this resource review, in combination with inspection of the immediate project vicinity, it appears that the standard full Level 2 flow control and phosphorus control for water quality are appropriate requirements for this project.

Jazz Run - Upstream Contributing Basin

Mead & Hunt

EXHIBIT 3.1
UPSTREAM BASIN MAP



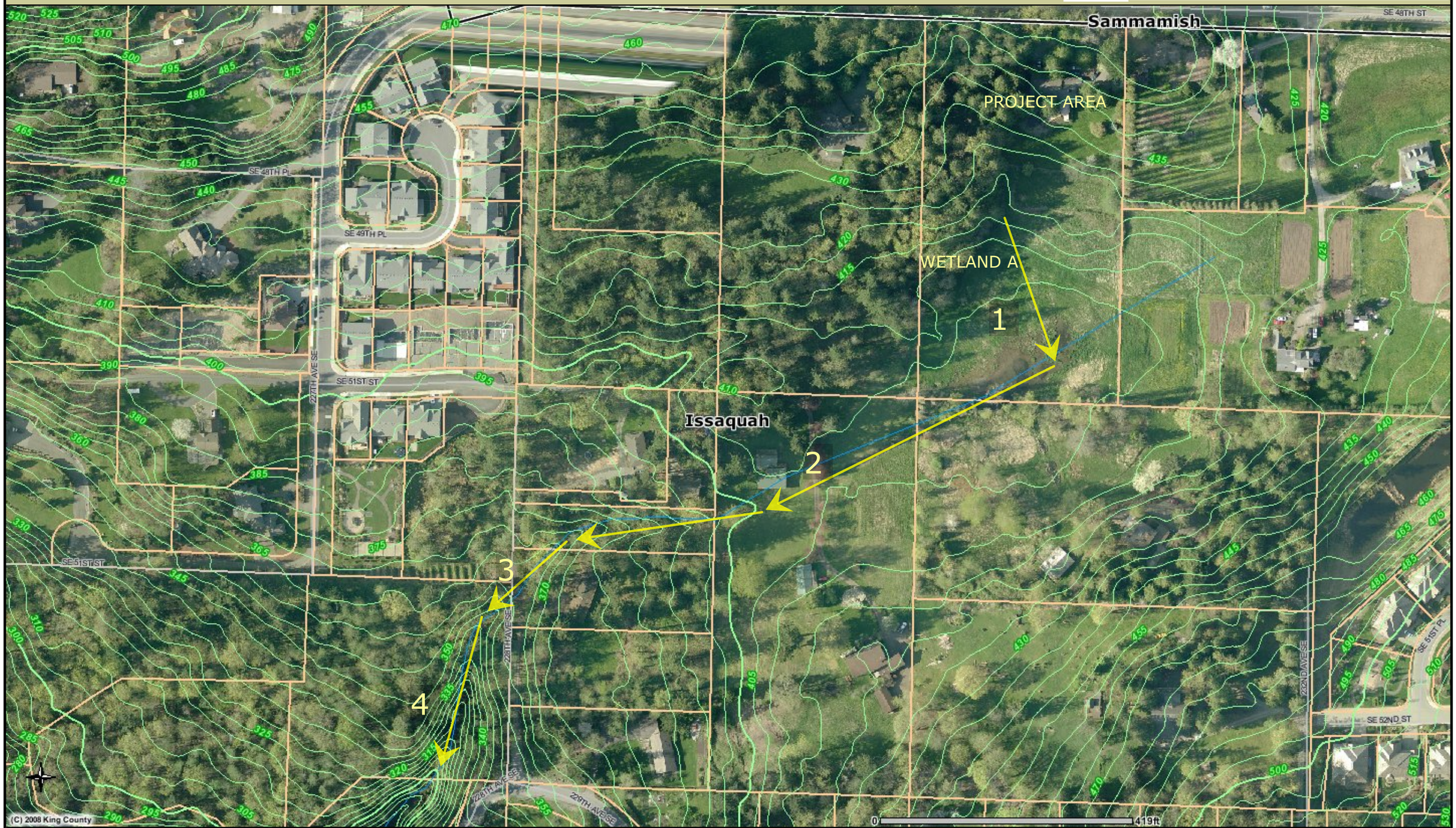
Date: 12/20/2014 Source: King County iMAP - Property Information (http://www.metrokc.gov/GIS/iMAP)

King County

Jazz Run - West Downstream Map

Mead & Hunt

EXHIBIT 3.2 - WEST BASIN

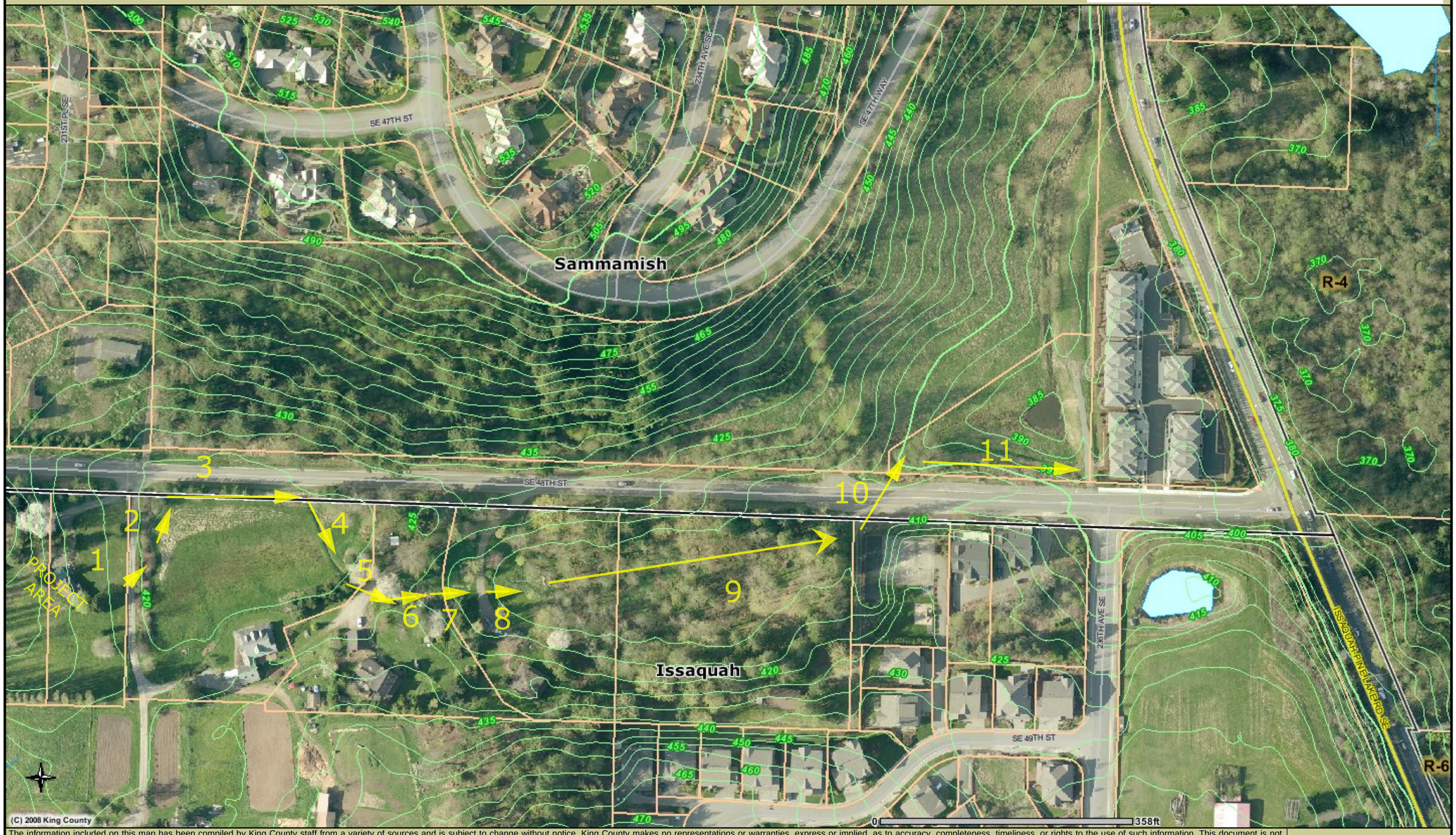


Date: 12/20/2014 Source: King County iMAP - Property Information (http://www.metrokc.gov/GIS/iMAP)

King County

Jazz Run - East Downstream Map

Mead & Hunt | EXHIBIT 3.3 - EAST BASIN

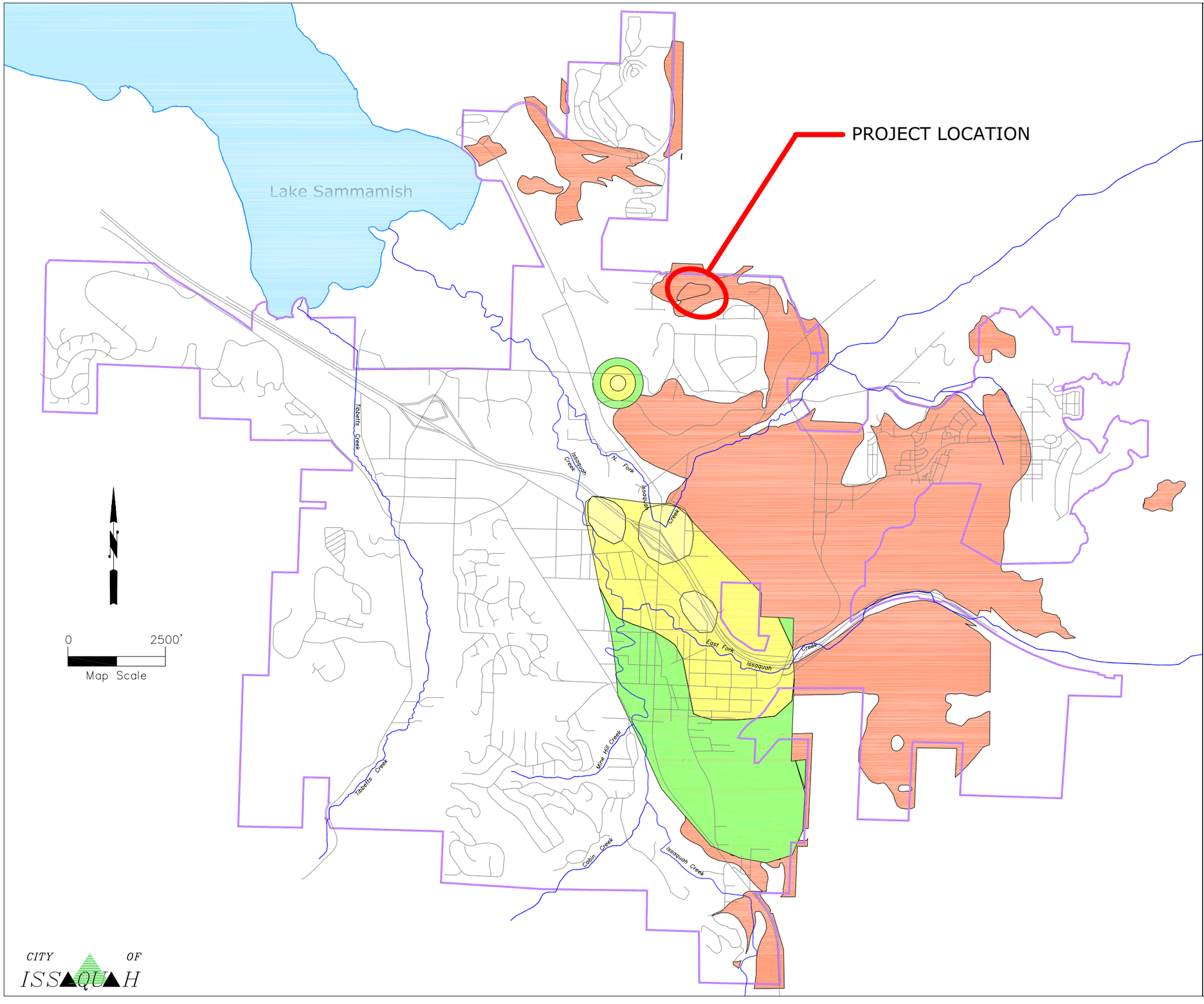


Date: 12/20/2014 Source: King County iMAP - Property Information (http://www.metrokc.gov/GIS/iMAP)

King County

EXHIBIT 3.5 - ISSAQUAH
CARA MAP

CRITICAL AQUIFER RECHARGE AREA CLASSIFICATION MAP



LEGEND

CARA CLASSES

- Class 1 - 1 & 5 year Wellhead Capture Zone
- Class 2 - 10 year Wellhead Capture Zone
- Class 3 - High Aquifer Recharge Area

AB 5676
Exhibit A
Page A-66

Notes:
1) CARA Class 1 and Class 2 are based on wellhead capture zones that are documented in Lower Issaquah Valley Wellhead Protection Plan (Golder Associates, 1993) and Wellhead Protection Delineation for Overdale Well (Golder Associates, 1997).

2) CARA Class 3– High Aquifer Recharge Area is based on surficial geology and soil units have high to moderate susceptibility to contamination. Sources for recharge area mapping include: Geologic Map of the Issaquah 7.5' Quadrangle (Booth and Minard, 1992) for all areas except Issaquah Highlands; Report on Geotechnical Services, Draft Environmental Impact Statement for Proposed Grand Ridge Development (Geoengineers, 1995) for Issaquah Highlands; and King County Soil Survey (U.S. Soil Conservation Service, 1973) for all areas.

CITY OF ISSAQUAH

Exhibit C to Ordinance: CARA Map

4. Flow Control Analysis and Design

A. Existing Site Hydrology

West Basin

The West Basin (see **Exhibit 4.1** at the end of this section) is 3.46 acres and drains initially to the south into a wetland area but eventually flows to the west. This area also includes most of the Teunissen LLA remainder parcel even though that area is not included in the plat proposal. The steepest slopes are 25% at the northwest corner near SE 48th Street and appear to have been created for historic construction of the public roadway. This is where the culvert from the right-of-way discharges water to the site into a large swale/ravine that traverses the project site from the northwest corner (at the culvert discharge point), southeasterly, down to the wetland buffer.

The ravine/swale bottom slopes at 3 to 5%, and there is no channel or erosion from the culvert discharge. The ravine area is wooded with mature trees and light (fern) underbrush. There are two single-family buildings, driveways, and various outbuildings within this basin. About 50% of the basin pervious area is cleared and used as lawn or landscaping. For flow control design purposes, the entire basin is considered to be forest for the existing condition except for replaced impervious surface. Pervious areas are modeled as till soils, based on results of geotechnical investigations.

East Basin

The East Basin (see **Exhibit 4.1** at the end of this section) is 1.27 acres that drains to the east. The average slope is about 6% to the southeast. Land cover consists of a small single-family house, driveway, and lawn with a few mature trees. This area is modeled entirely as forest for the existing conditions flow control calculations except for replaced impervious surface.

West Basin Offsite

This 0.09-acre basin is a portion of the SE 48th Street roadway that will not be replaced but will drain into the improved part of the road from which runoff will be collected for flow control and water quality treatment. This area is included in the West Basin and is not delineated separately.

East Basin Offsite

This 0.10-acre basin is a portion of the SE 48th Street roadway that will not be replaced but will drain into the improved part of the road from which runoff will be collected for flow control and water quality treatment. This area is included in the East Basin and is not delineated separately.

The West and East basins are separate threshold discharge areas (TDAs) because the downstream flow paths for each basin converge at greater than ¼ mile downstream.

B. Developed Site Hydrology

Grade constraints for roads and lots will require significant cuts and fills to develop the project. Two of the three existing single-family houses will be removed, and most of the trees and vegetation will also be removed. Runoff from the West Offsite Contributing Area will be collected separately in SE 48th Street and conveyed through the site, bypassing treatment and detention. That separate conveyance will be connected to the West Basin outfall dispersal system so that there will no longer be a point discharge for

runoff from that area. **Exhibit 4.2** at the end of this section shows the proposed conditions and basin delineation for stormwater collection. Following is a detailed description of each developed basin:

West Basin

The West Basin is a 2.56-acre area that includes:

- Road A and Road B
- Most of Lots 1–4 (see map)
- Front yard and driveways for Lots 6-8
- Roof tops and driveways for 3 future Teunissen short plat lots and Jazz Run Lots 9 and 10
- Lots 17–19

West Bypass Basin

About 1.21 acres of the west basin will be effectively dispersed to the south (see hatched area on **Exhibit 4.2**) through open space and wetland buffer. This includes the undisturbed areas at the rear of Lots 1–4, roof and rear yard for Lot 5, and the area south of the driveways for lots 6–10 and three future Teunissen short plat lots. This area is modeled as Forested and is connected directly to the Point of Compliance for the West Basin, bypassing the flow control facility.

All driveways (except for the Teunissen property) are planned to be sloped toward the roads so that runoff can be collected and treated. Runoff collected in catch basins will be routed to Kristar Perk Filter vaults for treatment and then into a detention vault in Tract A. Discharge from detention will flow to a dispersal system placed within the wetland buffer below the new buffer trail.

East Basin

The East Basin (0.87 acres—see **Exhibit 4.2**) consists of:

- The south half of SE 48th Street right of way
- Rear yards and roofs for Lots 11–16

C. Performance Standards

Full Level 2 duration control standards have been used to calculate detention volumes for the West Basin. This means that runoff durations for the developed conditions have been set to match (within WSDOT designated tolerances) the pre-developed durations for storm flow rates from 50% of the 2-year peak rate up to the 50-year peak rate, assuming historic forested conditions and existing impervious surfacing that will be replaced for the calculated pre-developed rates. Peak runoff rates for the East Basin actual existing conditions and for the developed conditions are calculated using the WWHM 2012 software so that the 100-year return rates could be compared.

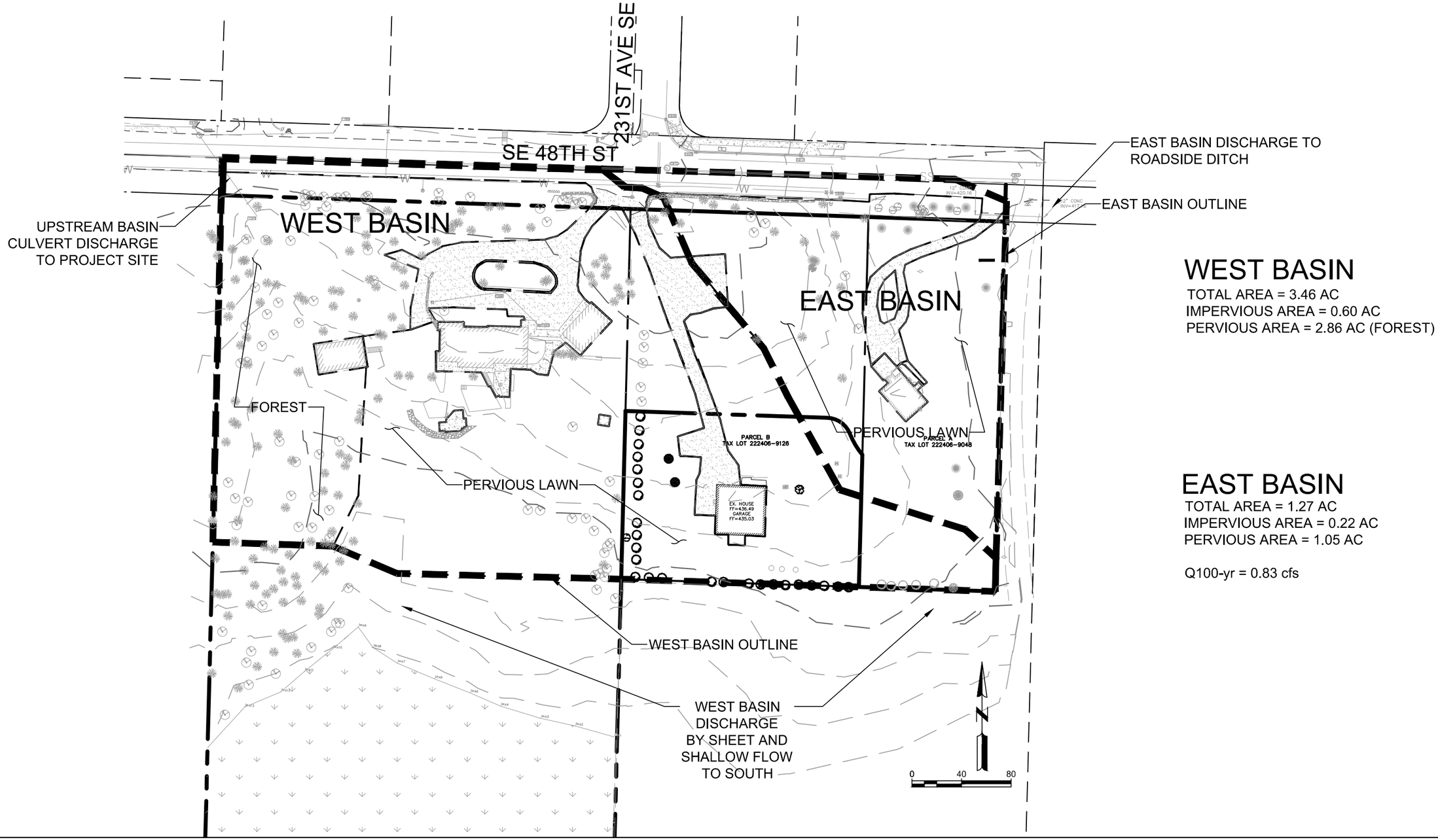
D. Hydrologic Analysis

The WWHM 2012 software program was used for all peak rate and detention/flow control sizing calculations. Till soils were assumed based on geotechnical investigations and recommendations for the soil conditions found on the site. Impervious areas for each lot (including the future Teunissen short plat) are assumed to be 50% of the total lot area (this varies from 2668 sf impervious – lots 2-5, to over 4,000

sf each for the 3 future Teunnisen lots) and assumes driveway areas are 400 sf each. Rear yard patios are assumed to disperse through lawn and are counted as lawn and landscape. All fully dispersed pervious and impervious areas (see hatched area in Exhibit 4.2) are modeled as “forested.” Software printouts for each detention system calculation are included at the end of this section.

The WWHM12 software was used to size a detention vault having a storage depth of 6.0 feet and width of 38 feet (to match vault designs), 12” riser, orifice 1 = 1.8” diameter, orifice 2 = 1.8” diameter at elevation +4.0’. The resulting length required is 116 feet.

For the proposed configuration of the East Basin, it was found that the increase in the 100-year peak runoff rate was less than 0.10 cfs so that a flow control management facility is not required. The existing condition rate is 0.83 cfs and the developed condition peak rate is 0.85 cfs.



WEST BASIN

TOTAL AREA = 3.46 AC
IMPERVIOUS AREA = 0.60 AC
PERVIOUS AREA = 2.86 AC (FOREST)

EAST BASIN

TOTAL AREA = 1.27 AC
IMPERVIOUS AREA = 0.22 AC
PERVIOUS AREA = 1.05 AC

Q100-yr = 0.83 cfs

Mead & Hunt

JAZZ RUN SUBDIVISION

EXHIBIT 4.1

EXISTING CONDITIONS BASIN MAP

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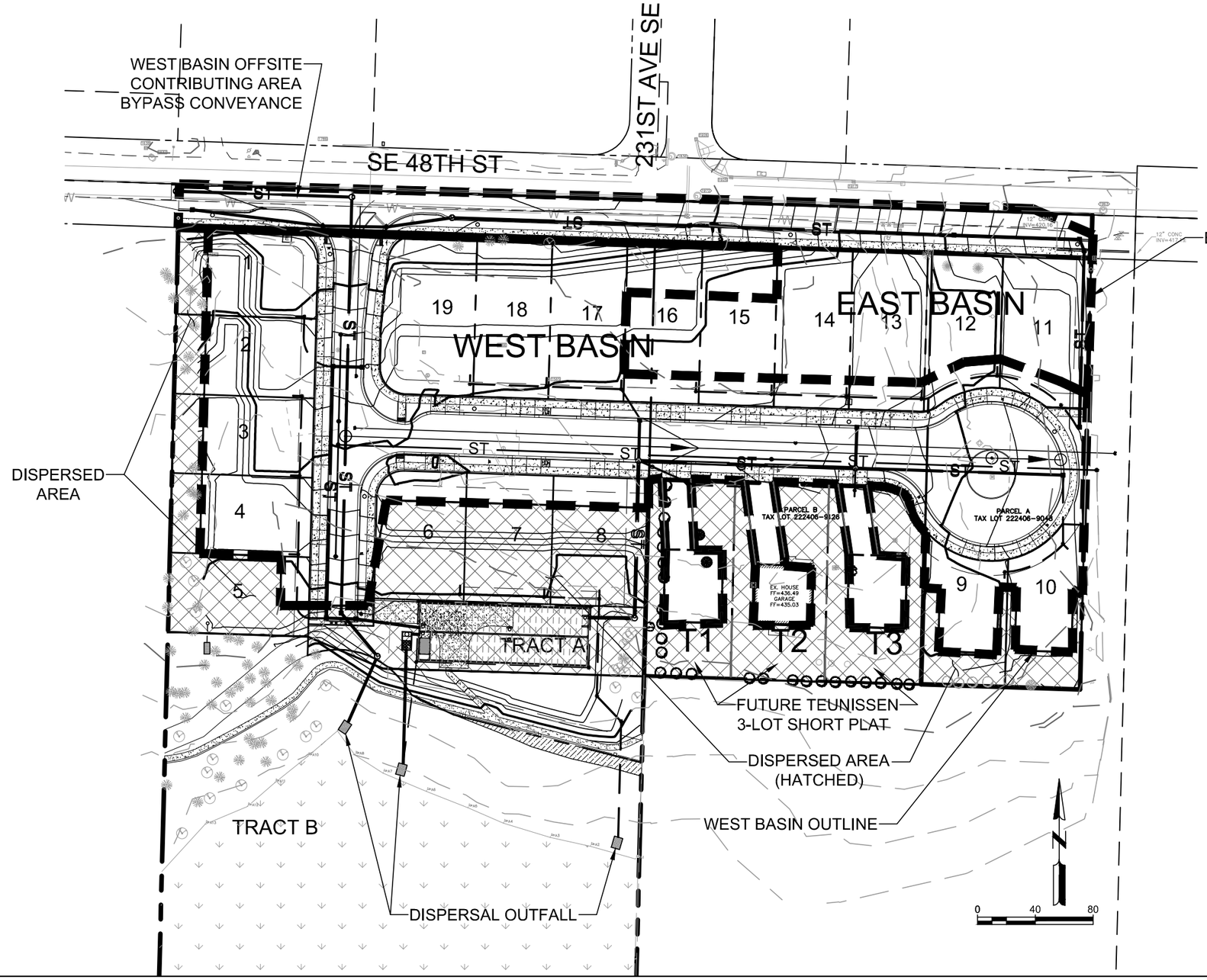

WEST BASIN

TOTAL AREA = 2.56 AC
IMPERVIOUS AREA = 1.81 AC
PERVIOUS AREA = 0.75 AC (LAWN)
DISPERSED AREA = 1.44 AC (FORESTED-BYPASS)

WEST BYPASS BASIN

TOTAL AREA = 1.21 AC
DISPERSED AREA = 1.21 AC (FORESTED-BYPASS)

WEST BASIN NOTES:

1. Forested condition represents dispersed area that bypasses the detention facility.
2. Future Teunissen short plat driveways (~1,000 sf each) are collected in road b storm system and conveyed to jazz run water quality treatment and flow control vault.
3. Future Teunissen short plat roof tops are collected with roof top drainage from jazz run lots 9 and 10 and conveyed to the west for dispersal within Tract A.

EAST BASIN

TOTAL AREA = 0.87 AC
IMPERVIOUS AREA = 0.69 AC
PERVIOUS AREA = 0.18 AC (LAWN)

Q100-yr = 0.85 cfs
(flow control facility is exempt - delta Q100-yr is less than 0.10 cfs)

Mead & Hunt

JAZZ RUN SUBDIVISION

EXHIBIT 4.2

DEVELOPED CONDITIONS
BASIN MAP

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WWHM2012

PROJECT REPORT

General Model Information

Project Name: Jazz Run Final FC Calcs 070115
Site Name:
Site Address:
City:
Report Date: 7/2/2015
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.17
Version: 2014/02/18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin West

Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	2.86
Pervious Total	2.86

Impervious Land Use	Acres
ROADS MOD	0.6
Impervious Total	0.6
Basin Total	3.46

Element Flows To:

Surface	Interflow	Groundwater

Basin East

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
C, Lawn, Mod	1.05
Pervious Total	1.05

Impervious Land Use	Acres
ROADS MOD	0.22
Impervious Total	0.22
Basin Total	1.27

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin West Dev

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
C, Lawn, Mod	0.75
Pervious Total	0.75

Impervious Land Use	Acres
ROADS MOD	1.81
Impervious Total	1.81
Basin Total	2.56

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Basin West Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	Acres
C, Forest, Mod	1.21
Pervious Total	1.21

Impervious Land Use	Acres
Impervious Total	0
Basin Total	1.21

Element Flows To:

Surface	Interflow	Groundwater

Basin East Dev

Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Lawn, Mod	0.18
Pervious Total	0.18

Impervious Land Use	Acres
ROADS MOD	0.69
Impervious Total	0.69
Basin Total	0.87

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 38 ft.
Length: 116 ft.
Depth: 7 ft.
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 1.8 in. Elevation:0 ft.
Orifice 2 Diameter: 1.8 in. Elevation:4 ft.
Element Flows To:
Outlet 1 Outlet 2

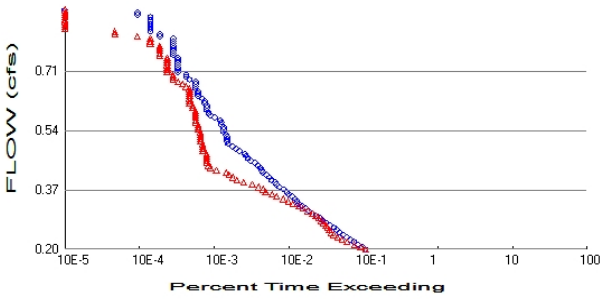
Vault Hydraulic Table

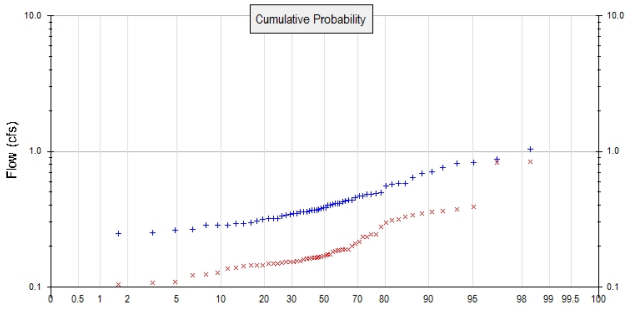
Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.101	0.000	0.000	0.000
0.0778	0.101	0.007	0.023	0.000
0.1556	0.101	0.015	0.033	0.000
0.2333	0.101	0.023	0.041	0.000
0.3111	0.101	0.031	0.047	0.000
0.3889	0.101	0.039	0.053	0.000
0.4667	0.101	0.047	0.058	0.000
0.5444	0.101	0.055	0.062	0.000
0.6222	0.101	0.063	0.067	0.000
0.7000	0.101	0.070	0.071	0.000
0.7778	0.101	0.078	0.075	0.000
0.8556	0.101	0.086	0.078	0.000
0.9333	0.101	0.094	0.082	0.000
1.0111	0.101	0.102	0.085	0.000
1.0889	0.101	0.110	0.088	0.000
1.1667	0.101	0.118	0.091	0.000
1.2444	0.101	0.125	0.094	0.000
1.3222	0.101	0.133	0.097	0.000
1.4000	0.101	0.141	0.100	0.000
1.4778	0.101	0.149	0.103	0.000
1.5556	0.101	0.157	0.106	0.000
1.6333	0.101	0.165	0.108	0.000
1.7111	0.101	0.173	0.111	0.000
1.7889	0.101	0.181	0.113	0.000
1.8667	0.101	0.188	0.116	0.000
1.9444	0.101	0.196	0.118	0.000
2.0222	0.101	0.204	0.121	0.000
2.1000	0.101	0.212	0.123	0.000
2.1778	0.101	0.220	0.125	0.000
2.2556	0.101	0.228	0.127	0.000
2.3333	0.101	0.236	0.130	0.000
2.4111	0.101	0.244	0.132	0.000
2.4889	0.101	0.251	0.134	0.000
2.5667	0.101	0.259	0.136	0.000
2.6444	0.101	0.267	0.138	0.000
2.7222	0.101	0.275	0.140	0.000
2.8000	0.101	0.283	0.142	0.000
2.8778	0.101	0.291	0.144	0.000
2.9556	0.101	0.299	0.146	0.000

3.0333	0.101	0.307	0.148	0.000
3.1111	0.101	0.314	0.150	0.000
3.1889	0.101	0.322	0.152	0.000
3.2667	0.101	0.330	0.153	0.000
3.3444	0.101	0.338	0.155	0.000
3.4222	0.101	0.346	0.157	0.000
3.5000	0.101	0.354	0.159	0.000
3.5778	0.101	0.362	0.161	0.000
3.6556	0.101	0.369	0.162	0.000
3.7333	0.101	0.377	0.164	0.000
3.8111	0.101	0.385	0.166	0.000
3.8889	0.101	0.393	0.167	0.000
3.9667	0.101	0.401	0.169	0.000
4.0444	0.101	0.409	0.189	0.000
4.1222	0.101	0.417	0.202	0.000
4.2000	0.101	0.425	0.212	0.000
4.2778	0.101	0.432	0.220	0.000
4.3556	0.101	0.440	0.228	0.000
4.4333	0.101	0.448	0.235	0.000
4.5111	0.101	0.456	0.241	0.000
4.5889	0.101	0.464	0.247	0.000
4.6667	0.101	0.472	0.253	0.000
4.7444	0.101	0.480	0.258	0.000
4.8222	0.101	0.488	0.264	0.000
4.9000	0.101	0.495	0.269	0.000
4.9778	0.101	0.503	0.274	0.000
5.0556	0.101	0.511	0.278	0.000
5.1333	0.101	0.519	0.283	0.000
5.2111	0.101	0.527	0.287	0.000
5.2889	0.101	0.535	0.292	0.000
5.3667	0.101	0.543	0.296	0.000
5.4444	0.101	0.550	0.300	0.000
5.5222	0.101	0.558	0.305	0.000
5.6000	0.101	0.566	0.309	0.000
5.6778	0.101	0.574	0.313	0.000
5.7556	0.101	0.582	0.316	0.000
5.8333	0.101	0.590	0.320	0.000
5.9111	0.101	0.598	0.324	0.000
5.9889	0.101	0.606	0.328	0.000
6.0667	0.101	0.613	0.499	0.000
6.1444	0.101	0.621	0.870	0.000
6.2222	0.101	0.629	1.359	0.000
6.3000	0.101	0.637	1.942	0.000
6.3778	0.101	0.645	2.607	0.000
6.4556	0.101	0.653	3.344	0.000
6.5333	0.101	0.661	4.146	0.000
6.6111	0.101	0.669	5.008	0.000
6.6889	0.101	0.676	5.928	0.000
6.7667	0.101	0.684	6.900	0.000
6.8444	0.101	0.692	7.923	0.000
6.9222	0.101	0.700	8.994	0.000
7.0000	0.101	0.708	10.11	0.000
7.0778	0.101	0.716	11.27	0.000
7.1556	0.000	0.000	12.47	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.86
Total Impervious Area: 0.6

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.96
Total Impervious Area: 1.81

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.398024
5 year	0.536357
10 year	0.637201
25 year	0.775552
50 year	0.886825
100 year	1.005365

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.183887
5 year	0.273443
10 year	0.346856
25 year	0.45782
50 year	0.55516
100 year	0.666386

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.569	0.171
1950	0.497	0.190
1951	0.381	0.360
1952	0.265	0.144
1953	0.250	0.124
1954	0.320	0.161
1955	0.321	0.215
1956	0.374	0.184
1957	0.410	0.182
1958	0.299	0.174

1959	0.286	0.155
1960	0.456	0.314
1961	0.348	0.165
1962	0.237	0.127
1963	0.349	0.165
1964	0.356	0.165
1965	0.405	0.166
1966	0.292	0.137
1967	0.558	0.210
1968	0.490	0.152
1969	0.343	0.167
1970	0.370	0.156
1971	0.414	0.174
1972	0.467	0.233
1973	0.246	0.150
1974	0.425	0.149
1975	0.433	0.200
1976	0.367	0.163
1977	0.294	0.104
1978	0.399	0.149
1979	0.467	0.122
1980	0.815	0.244
1981	0.357	0.139
1982	0.577	0.331
1983	0.382	0.187
1984	0.286	0.142
1985	0.307	0.144
1986	0.413	0.297
1987	0.403	0.311
1988	0.284	0.144
1989	0.437	0.108
1990	1.037	0.373
1991	0.691	0.339
1992	0.334	0.149
1993	0.321	0.159
1994	0.260	0.091
1995	0.316	0.187
1996	0.638	0.348
1997	0.438	0.365
1998	0.378	0.153
1999	0.759	0.245
2000	0.362	0.152
2001	0.367	0.107
2002	0.483	0.278
2003	0.582	0.168
2004	0.708	0.832
2005	0.358	0.189
2006	0.340	0.189
2007	0.875	0.391
2008	0.826	0.823
2009	0.480	0.233

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0371	0.8320
2	0.8753	0.8228
3	0.8256	0.3906

4	0.8151	0.3726
5	0.7585	0.3647
6	0.7084	0.3600
7	0.6913	0.3478
8	0.6383	0.3392
9	0.5824	0.3307
10	0.5768	0.3137
11	0.5692	0.3106
12	0.5584	0.2973
13	0.4974	0.2783
14	0.4898	0.2446
15	0.4827	0.2441
16	0.4801	0.2335
17	0.4670	0.2328
18	0.4666	0.2153
19	0.4564	0.2101
20	0.4379	0.1999
21	0.4369	0.1900
22	0.4331	0.1890
23	0.4253	0.1886
24	0.4136	0.1868
25	0.4134	0.1866
26	0.4101	0.1838
27	0.4054	0.1820
28	0.4033	0.1742
29	0.3993	0.1738
30	0.3819	0.1706
31	0.3814	0.1681
32	0.3783	0.1665
33	0.3744	0.1656
34	0.3699	0.1651
35	0.3668	0.1648
36	0.3667	0.1646
37	0.3616	0.1627
38	0.3577	0.1606
39	0.3570	0.1595
40	0.3556	0.1556
41	0.3491	0.1547
42	0.3484	0.1526
43	0.3428	0.1525
44	0.3403	0.1521
45	0.3339	0.1498
46	0.3211	0.1490
47	0.3208	0.1488
48	0.3197	0.1487
49	0.3162	0.1444
50	0.3069	0.1443
51	0.2986	0.1440
52	0.2939	0.1420
53	0.2917	0.1389
54	0.2860	0.1367
55	0.2860	0.1268
56	0.2842	0.1241
57	0.2648	0.1221
58	0.2603	0.1080
59	0.2502	0.1068
60	0.2462	0.1040
61	0.2367	0.0907

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1990	2278	2282	100	Pass
0.2060	2064	1981	95	Pass
0.2129	1808	1618	89	Pass
0.2199	1610	1293	80	Pass
0.2268	1421	1111	78	Pass
0.2338	1275	965	75	Pass
0.2407	1144	857	74	Pass
0.2476	1028	789	76	Pass
0.2546	943	747	79	Pass
0.2615	860	710	82	Pass
0.2685	768	676	88	Pass
0.2754	676	634	93	Pass
0.2824	622	583	93	Pass
0.2893	564	540	95	Pass
0.2963	497	497	100	Pass
0.3032	443	447	100	Pass
0.3102	397	388	97	Pass
0.3171	358	331	92	Pass
0.3241	323	293	90	Pass
0.3310	290	244	84	Pass
0.3380	275	212	77	Pass
0.3449	261	179	68	Pass
0.3519	235	147	62	Pass
0.3588	213	127	59	Pass
0.3658	203	105	51	Pass
0.3727	182	98	53	Pass
0.3796	162	84	51	Pass
0.3866	147	69	46	Pass
0.3935	139	53	38	Pass
0.4005	124	43	34	Pass
0.4074	117	38	32	Pass
0.4144	106	34	32	Pass
0.4213	97	31	31	Pass
0.4283	92	23	25	Pass
0.4352	89	19	21	Pass
0.4422	82	18	21	Pass
0.4491	76	17	22	Pass
0.4561	66	17	25	Pass
0.4630	60	17	28	Pass
0.4700	57	17	29	Pass
0.4769	55	17	30	Pass
0.4839	46	15	32	Pass
0.4908	42	15	35	Pass
0.4978	38	15	39	Pass
0.5047	33	15	45	Pass
0.5117	32	14	43	Pass
0.5186	32	14	43	Pass
0.5255	32	14	43	Pass
0.5325	31	14	45	Pass
0.5394	29	14	48	Pass
0.5464	29	13	44	Pass
0.5533	29	13	44	Pass
0.5603	27	13	48	Pass

0.5672	27	12	44	Pass
0.5742	26	12	46	Pass
0.5811	22	12	54	Pass
0.5881	19	12	63	Pass
0.5950	18	12	66	Pass
0.6020	17	12	70	Pass
0.6089	17	11	64	Pass
0.6159	17	11	64	Pass
0.6228	16	10	62	Pass
0.6298	16	10	62	Pass
0.6367	15	10	66	Pass
0.6437	13	10	76	Pass
0.6506	13	10	76	Pass
0.6576	13	10	76	Pass
0.6645	12	10	83	Pass
0.6714	12	9	75	Pass
0.6784	12	8	66	Pass
0.6853	12	7	58	Pass
0.6923	10	6	60	Pass
0.6992	9	6	66	Pass
0.7062	9	6	66	Pass
0.7131	7	5	71	Pass
0.7201	7	5	71	Pass
0.7270	7	5	71	Pass
0.7340	7	5	71	Pass
0.7409	7	5	71	Pass
0.7479	7	5	71	Pass
0.7548	7	5	71	Pass
0.7618	6	4	66	Pass
0.7687	6	4	66	Pass
0.7757	6	4	66	Pass
0.7826	6	4	66	Pass
0.7896	6	4	66	Pass
0.7965	6	3	50	Pass
0.8035	6	3	50	Pass
0.8104	6	3	50	Pass
0.8173	4	2	50	Pass
0.8243	4	1	25	Pass
0.8312	3	1	33	Pass
0.8382	3	0	0	Pass
0.8451	3	0	0	Pass
0.8521	3	0	0	Pass
0.8590	3	0	0	Pass
0.8660	3	0	0	Pass
0.8729	3	0	0	Pass
0.8799	2	0	0	Pass
0.8868	2	0	0	Pass

Water Quality

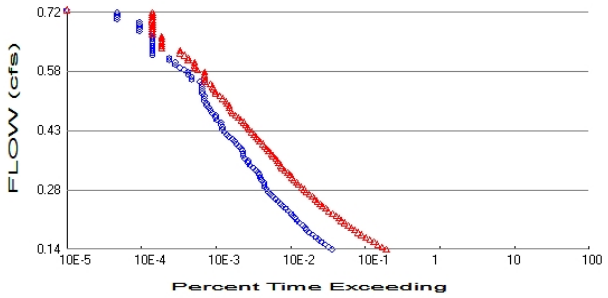
Water Quality BMP Flow and Volume for POC #1

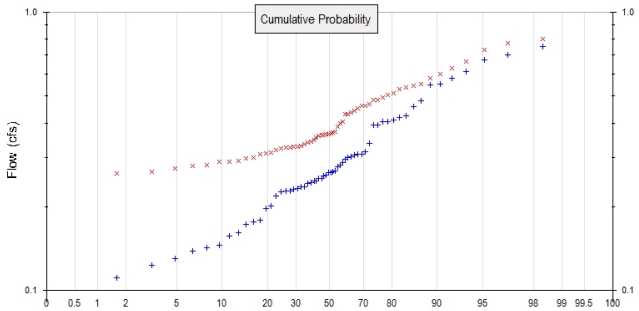
On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	387.06			☐	0.00			
Total Volume Infiltrated		387.06	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50-yr									Duration Analysis Result = Failed

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 1.05
Total Impervious Area: 0.22

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.18
Total Impervious Area: 0.69

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.271738
5 year	0.402707
10 year	0.496814
25 year	0.623589
50 year	0.723532
100 year	0.828069

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.386069
5 year	0.496869
10 year	0.574819
25 year	0.678755
50 year	0.760265
100 year	0.845381

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1949	0.459	0.511
1950	0.424	0.495
1951	0.258	0.300
1952	0.139	0.252
1953	0.143	0.291
1954	0.227	0.314
1955	0.232	0.367
1956	0.242	0.337
1957	0.309	0.371
1958	0.179	0.309
1959	0.157	0.329

1960	0.269	0.341
1961	0.228	0.324
1962	0.131	0.267
1963	0.265	0.340
1964	0.219	0.320
1965	0.308	0.388
1966	0.173	0.275
1967	0.419	0.461
1968	0.394	0.599
1969	0.303	0.358
1970	0.260	0.356
1971	0.300	0.431
1972	0.410	0.443
1973	0.123	0.264
1974	0.309	0.405
1975	0.314	0.398
1976	0.230	0.326
1977	0.247	0.330
1978	0.278	0.460
1979	0.252	0.550
1980	0.551	0.631
1981	0.266	0.371
1982	0.479	0.544
1983	0.289	0.430
1984	0.177	0.282
1985	0.248	0.364
1986	0.244	0.312
1987	0.268	0.484
1988	0.111	0.327
1989	0.162	0.503
1990	0.753	0.665
1991	0.580	0.581
1992	0.197	0.290
1993	0.145	0.363
1994	0.098	0.299
1995	0.201	0.330
1996	0.403	0.451
1997	0.295	0.348
1998	0.254	0.362
1999	0.673	0.800
2000	0.282	0.362
2001	0.226	0.437
2002	0.404	0.468
2003	0.394	0.482
2004	0.613	0.775
2005	0.236	0.292
2006	0.235	0.280
2007	0.703	0.732
2008	0.548	0.535
2009	0.338	0.528

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.7534	0.7998
2	0.7028	0.7752
3	0.6726	0.7315
4	0.6125	0.6648

5	0.5798	0.6306
6	0.5511	0.5991
7	0.5478	0.5806
8	0.4788	0.5500
9	0.4586	0.5444
10	0.4242	0.5350
11	0.4193	0.5276
12	0.4100	0.5108
13	0.4039	0.5025
14	0.4030	0.4950
15	0.3943	0.4837
16	0.3937	0.4825
17	0.3384	0.4685
18	0.3142	0.4609
19	0.3094	0.4596
20	0.3088	0.4505
21	0.3075	0.4429
22	0.3033	0.4369
23	0.2996	0.4308
24	0.2952	0.4295
25	0.2890	0.4051
26	0.2817	0.3984
27	0.2782	0.3877
28	0.2688	0.3711
29	0.2677	0.3705
30	0.2657	0.3674
31	0.2646	0.3639
32	0.2601	0.3633
33	0.2580	0.3623
34	0.2536	0.3618
35	0.2519	0.3585
36	0.2479	0.3557
37	0.2467	0.3478
38	0.2443	0.3415
39	0.2420	0.3400
40	0.2362	0.3366
41	0.2352	0.3299
42	0.2320	0.3295
43	0.2303	0.3291
44	0.2276	0.3269
45	0.2273	0.3262
46	0.2257	0.3238
47	0.2190	0.3203
48	0.2010	0.3139
49	0.1974	0.3115
50	0.1787	0.3087
51	0.1767	0.3003
52	0.1726	0.2992
53	0.1617	0.2921
54	0.1574	0.2907
55	0.1451	0.2904
56	0.1429	0.2824
57	0.1391	0.2804
58	0.1306	0.2747
59	0.1233	0.2668
60	0.1114	0.2636
61	0.0977	0.2515

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1359	760	4072	535	Fail
0.1418	683	3602	527	Fail
0.1477	618	3136	507	Fail
0.1537	549	2783	506	Fail
0.1596	499	2443	489	Fail
0.1655	461	2175	471	Fail
0.1715	423	1915	452	Fail
0.1774	376	1709	454	Fail
0.1834	345	1535	444	Fail
0.1893	330	1380	418	Fail
0.1952	309	1257	406	Fail
0.2012	280	1128	402	Fail
0.2071	259	1028	396	Fail
0.2130	244	944	386	Fail
0.2190	227	876	385	Fail
0.2249	216	776	359	Fail
0.2308	200	687	343	Fail
0.2368	182	632	347	Fail
0.2427	166	570	343	Fail
0.2487	157	532	338	Fail
0.2546	145	482	332	Fail
0.2605	134	451	336	Fail
0.2665	123	416	338	Fail
0.2724	113	379	335	Fail
0.2783	106	341	321	Fail
0.2843	101	325	321	Fail
0.2902	97	297	306	Fail
0.2961	94	270	287	Fail
0.3021	92	257	279	Fail
0.3080	87	234	268	Fail
0.3139	84	221	263	Fail
0.3199	81	209	258	Fail
0.3258	79	194	245	Fail
0.3318	73	177	242	Fail
0.3377	67	165	246	Fail
0.3436	62	157	253	Fail
0.3496	57	148	259	Fail
0.3555	57	141	247	Fail
0.3614	52	135	259	Fail
0.3674	49	125	255	Fail
0.3733	49	117	238	Fail
0.3792	48	109	227	Fail
0.3852	47	102	217	Fail
0.3911	43	96	223	Fail
0.3971	40	91	227	Fail
0.4030	38	82	215	Fail
0.4089	35	78	222	Fail
0.4149	32	73	228	Fail
0.4208	30	69	230	Fail
0.4267	28	64	228	Fail
0.4327	26	59	226	Fail
0.4386	26	57	219	Fail
0.4445	25	53	211	Fail
0.4505	25	51	204	Fail

0.4564	22	46	209	Fail
0.4623	21	42	200	Fail
0.4683	21	39	185	Fail
0.4742	19	35	184	Fail
0.4802	18	34	188	Fail
0.4861	17	32	188	Fail
0.4920	16	32	200	Fail
0.4980	16	30	187	Fail
0.5039	15	29	193	Fail
0.5098	15	26	173	Fail
0.5158	15	24	160	Fail
0.5217	14	21	150	Fail
0.5276	14	21	150	Fail
0.5336	14	20	142	Fail
0.5395	14	19	135	Fail
0.5455	14	18	128	Fail
0.5514	13	15	115	Fail
0.5573	10	15	150	Fail
0.5633	10	15	150	Fail
0.5692	9	15	166	Fail
0.5751	9	15	166	Fail
0.5811	8	12	150	Fail
0.5870	7	11	157	Fail
0.5929	6	11	183	Fail
0.5989	6	11	183	Fail
0.6048	5	9	180	Fail
0.6107	5	9	180	Fail
0.6167	3	8	266	Fail
0.6226	3	7	233	Fail
0.6286	3	7	233	Fail
0.6345	3	4	133	Fail
0.6404	3	4	133	Fail
0.6464	3	4	133	Fail
0.6523	3	4	133	Fail
0.6582	3	4	133	Fail
0.6642	3	4	133	Fail
0.6701	3	3	100	Pass
0.6760	2	3	150	Fail
0.6820	2	3	150	Fail
0.6879	2	3	150	Fail
0.6939	2	3	150	Fail
0.6998	2	3	150	Fail
0.7057	1	3	300	Fail
0.7117	1	3	300	Fail
0.7176	1	3	300	Fail
0.7235	1	3	300	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #2

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

Mitigated UCI File

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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5. Water Quality Analysis and Design

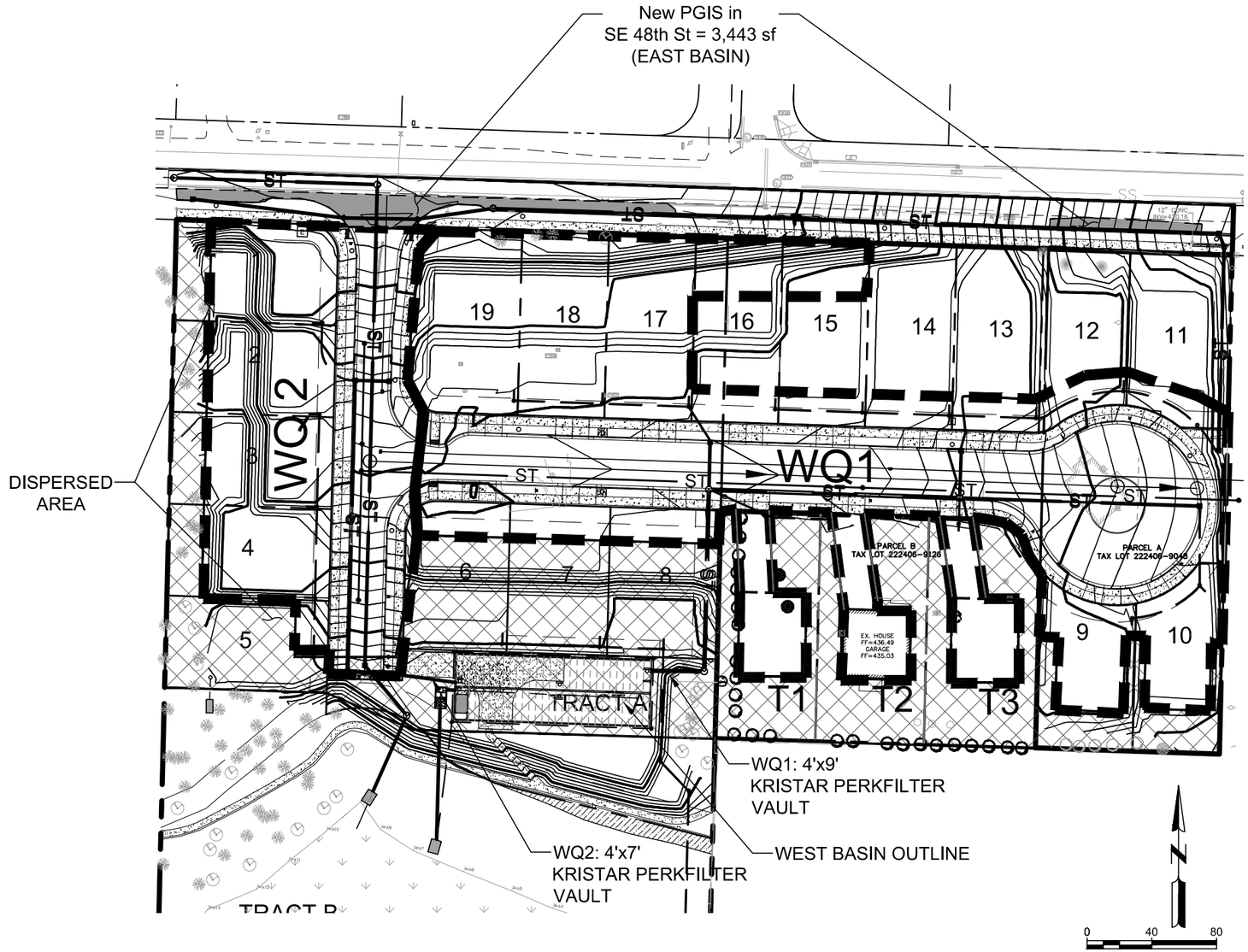
A. Analysis

Runoff from both the West Basin and the East Basin eventually discharge into Lake Sammamish. Large basins that contribute surface water to Lake Sammamish and add more than 5,000 sf of pollution generating impervious surfacing (PGIS) must provide treatment that removes more phosphorus than Basic Level treatment. Several options are available for use to meet the phosphorus removal, including proprietary systems that have obtained General Use Level Designation (GULD) approval from WSDOE. This project proposes to use the GULD listed proprietary Kristar Perk Filter system to meet water quality requirements for the West basin. Treatment will not be required for the East basin because less than 5,000 sf of new PGIS will be constructed within that TDA basin (approximately 3,450 sf total, all within the SE 48th Street right-of-way). **Exhibit 5.1 – Water Quality Basins Map**, at the end of this section, shows how the developed site will be configured for water quality treatment.

B. Design

The 2-year return event release rate from the detention vault is 0.18 cfs (see WWHM FC Calcs page 11 in Section 4 of this report). An 18" stack height cartridge was selected for the Kristar Perk Filters using a rate of 10.2 gpm per cartridge per GULD approval guidelines. A total of 8 cartridges are required for this project (0.18*449/10.2 = 7.9). In addition, Engineers from Oldcastle (suppliers of Kristar Perkfilters) have performed standard mass loading calculations and determined that the peak rate design method controls and they have confirmed that 8 cartridges will be adequate for this project.

Kristar vaults have an internal weir for high-flow bypass. A custom 7'x13' vault was designed by Kristar to meet the particular requirements from the City of Issaquah for vault access and access clearance to the cartridges for maintenance.



Note:
WQ treatment for East Basin is not required. This Threshold Discharge Area is exempt because less than 5,000 sf of new PGIS will be created.
(see KCSWDM Chapter 1.2.8, "Exemptions from Core Requirement #8", paragraph 2)

WEST BASIN NOTES:

1. Future Teunissen short plat driveways (~1,000 sf each) are collected in Road B storm system and conveyed to jazz run water quality treatment and flow control vault.
2. WQ treatment rate is based on 2-yr detention vault release rate because it is located downstream of detention.
3. Water quality is provided for all areas that contribute to the vault including lawn areas.

Mead & Hunt

JAZZ RUN SUBDIVISION

EXHIBIT 5.1

WATER QUALITY
BASINS MAP

Perkfilter Kristar GULD

WASHINGTON STATE DEPARTMENT OF ECOLOGY

May 2014

GENERAL USE LEVEL DESIGNATION FOR BASIC AND PHOSPHORUS TREATMENT

For

Kristar/Oldcastle Precast, Inc. FloGard Perk Filter™ (using ZPC Filter Media)

Ecology's Decision:

Based on Kristar/Oldcastle's application submissions, including the Draft Technical Evaluation Report, dated April 2010, Ecology hereby issues the following use level designations:

1. **General use level designation (GULD) for the Perk Filter™ for basic treatment:**
   - **Using a zeolite-perlite-carbon (ZPC) filter media as specified by Kristar/Oldcastle.**
   - **Sized at hydraulic loading rate of no more than 1.5 gpm/ft^2 of media surface area, per Table 1.**

Table 1. Design Flowrate per Cartridge

Effective Cartridge Height (inches)	12	18
Cartridge Flowrate (gpm/cartridge)	6.8	10.2

2. **General use level designation (GULD) for the Perk Filter™ for phosphorus treatment:**
   - **Using a zeolite-perlite-carbon (ZPC) filter media as specified by Kristar/Oldcastle.**
   - **Sized at hydraulic loading rate of no more than 1.5 gpm/ft^2 of media surface area, per Table 1.**

3. **Ecology approves Perk Filter™ units for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate. Calculate the water quality design flow rate using the following procedures:**

   - **Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**

- **Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**

- **Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**

4. **These General Use Level Designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.**

<u>Ecology's Conditions of Use:</u>

Perk Filter™ units shall comply with the following conditions:

1. **Design, assemble, install, operate, and maintain Perk Filter™ units in accordance with Kristar/Oldcastle's applicable manuals and documents and the Ecology Decision.**

2. **Each site plan must undergo Kristar/Oldcastle review and approval before site installation. This ensures that site grading and slope are appropriate for use of a Perk Filter™ unit.**

3. **Perk Filter™media shall conform to the specifications submitted to, and approved by, Ecology.**

4. **Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.**

- **Typically, Kristar/Oldcastle designs PerkFilter systems for a target filter media replacement interval of 12 months. Maintenance includes removing accumulated sediment from the vault, and replacing spent cartridges with recharged cartridges.**
- **Indications of the need for maintenance include effluent flow decreasing to below the design flow rate, as indicated by the scumline above the shoulder of the cartridge.**
- **Owners/operators must inspect PerkFilter for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.**

- **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**
- **When inspections are performed, the following findings typically serve as maintenance triggers:**
    - **Accumulated vault sediment depths exceed an average of 2 inches, or**
    - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
    - **Standing water remains in the vault between rain events, or**
    - **Bypass occurs during storms smaller than the design storm.**
- **Note: If excessive floatables (trash and debris) are present, perform a minor maintenance consisting of gross solids removal, not cartridge replacement.**

5. Discharges from the Perk Filter™ units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant: Kristar/Oldcastle Precast, Inc.

Applicant's Address: 360 Sutton Place
Santa Rosa, California 95407

Application Documents:

- Perk Filter™ Final Report, prepared by: Office of Water Programs, California State University, Sacramento (September 2007)
- Verification Phase of Perk Filter™ Tests with Zeolite-Perlite-Carbon Media and Zeolite-Carbon Media (August 2007)
- Quality Assurance Project Plan KriStar Perk Filter™ Stormwater Treatment Performance Monitoring Project, October 2008 Draft
- Technical Evaluation Report Volume 1: KriStar Perk Filter™ Stormwater Treatment System Performance Monitoring, April 2010
- Technical Evaluation Report Volume 2 - Appendices: KriStar Perk Filter™ Stormwater Treatment System Performance Monitoring, April 2010.

Applicant's Use Level Request:

- General use level designation as a basic and Phosphorus treatment device in accordance with Ecology's *Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision*.

Applicant's Performance Claims:

- Capability to remove 80% of total suspended solids from stormwater runoff from sites with influent concentrations between 100 mg/L and 200 mg/L and provide effluent concentrations of 20 mg/L or less with influent concentrations less than 100 mg/L given a typical particle size distribution.
- Capability to remove 50% of Total Phosphorus from stormwater runoff from sites with influent concentrations between 0.1 mg/l and 0.5 mg/l.

Findings of Fact:

- Based on laboratory testing at a flowrate of 12 GPM per filter, the Perk Filter™ containing ZPC media had an average total suspended solids removal efficiency of 82% using Sil-Co-Sil 106 with an average influent concentration of 102 mg/L and zero initial sediment loading.

- Based on field-testing at a flowrate of 0.57 GPM/inch of cartridge height (17.25 inch diameter cartridge) (1.5 gpm per sq ft filter surface area), the Perk Filter™ containing ZPC media had an average total suspended solids removal efficiency of 82.4% for an influent concentration between 20 mg/L and 200 mg/l. The Perk Filter™ containing ZPC media had an average removal efficiency of 85.2% for an influent concentration between 100 mg/l and 200 mg/l. Removal rates fell over time and dropped below 80% after approximately 10 months.

- Based on field testing at a flowrate of 0.57 GPM/inch of cartridge height (17.25 inch diameter cartridge) (1.5 gpm per sq ft filter surface area), the Perk Filter™ containing ZPC media had an average total Phosphorus removal efficiency of 62.4% for an influent concentration between 0.1 mg/L and 0.5 mg/l. Removal rates tended to remain relatively constant during the 10 months of monitoring.

- Field Testing indicates that sediment accumulation in the Sediment Gallery during the 10 months of sampling was within the available volume for sediment. Thus, maintenance at a 6-month frequency (vacuuming of sediment from Inlet Gallery) as suggested by the manufacturer is sufficient.

- Filter flows during bypass events utilize the full 30-inch height of the filter. Without bypass, an unknown amount of filter is used. Comparing the flow through the filter during bypass events with the design flow rate shows that the Kristar/Oldcastle system falls below the design flow rate after approximately 10 months of operation.

- Percent removal of TSS falls below 80% after approximately 10 months. There are earlier data points below 80% but these are from low influent concentration storms

Other Perk Filter™ Related Issues to be Addressed By the Company:

1. Kristar/Oldcastle may perform additional monitoring to better determine the maintenance frequency for the filters with respect to design flow rate and Total Suspended Solids removal. Presentation of additional data may result in a modification to the requirements in this Use Level designation document.

Technology Description: Download at www.kristar.com

Contact Information:

Applicant: Jay Holtz, P.E.
Engineering Manager
Kristar/Oldcastle Precast, Inc.
360 Sutton Place
Santa Rosa, CA, 95407
(800) 579-8819
jay.holtz@oldcastle.com

Applicant website: www.kristar.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
March 2008	Original Draft use-level-designation document
June 2010	Revise Use Level to General
January 2013	Modified Design Storm Description, added Revision Table, formatted document to match Ecology standard
May 2014	Revised Company name and contact information

Oldcastle Stormwater Solutions™

Perk Filter™ Downstream of Detention Sizing Summary

7/2/2015

Site Information

Project Name	**Jazz Run**	
Project Location	**Issaquah, WA**	
Design Engineer	**Mead & Hunt, Inc**	
OSS Engineer	**A Generes**	
Drainage Area	**2.29**	ac
Impervious Drainage Area (PGIS)	**1.4**	ac
Impervious Drainage Area (NPGIS)	**0.00**	ac
Pervious Area	**0.89**	ac
% Impervious	**61%**	
Runoff Coefficient	**0.60**	

Flow-Based Calculations

Treatment Release Rate	**0.175**	cfs
Peak Release Rate (Q_p)		cfs
Cartridge Stack Height	**18**	in
Allowed Loading Rate (1.5 or 2.5)	**1.5**	gpm/sf
Allowed Cartridge Flow Capacity	**10.2**	gpm
Number of Cartridge Stacks Required	**8**	

Mass Loading Calculations

Mean Annual Rainfall (P)	**39**	in
Required % Removal	**80%**	
Required % Runoff Capture	**91%**	
Mean Annual Runoff (V_t)	**177,075**	cf
Assumed Pollutant EMC	**80**	mg/L
Annual Mass Load	**882.34**	lb
Detention Pretreatment Credit	**50%**	

Cartridge Quantity Based on Mass Loading

Mass Removed by Pretreatment	**441.17**	lb
Mass Load to Filter after Pretreatment	**441.17**	lb
Required Filter Efficiency	**50%**	
Mass Removal Required	**220.59**	lb
Allowed Cartridge Flow Capacity	**10.2**	gpm
Mass Load per Cartridge	**57**	lb
Number of Cartridge Stacks Required	**4**	
Treatment Flow Capacity	**0.09**	cfs

Determine Limiting Sizing Approach

Method to Use (Flow-Based, Mass Load)	**Flow-Based**

Summary

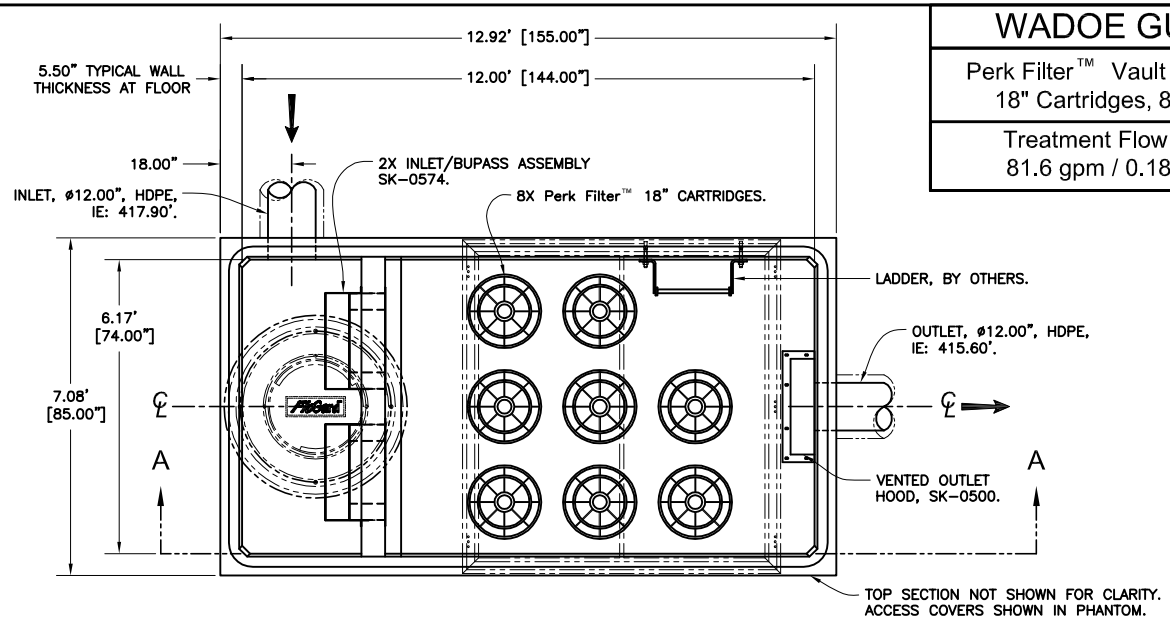
Treatment Flow Rate Provided	**0.18**	cfs
Cartridge Stack Flow Capacity	**10.2**	gpm
Cartridge Stack Height	**18**	in
Number of Cartridge Stacks	**8**	

WADOE GULD

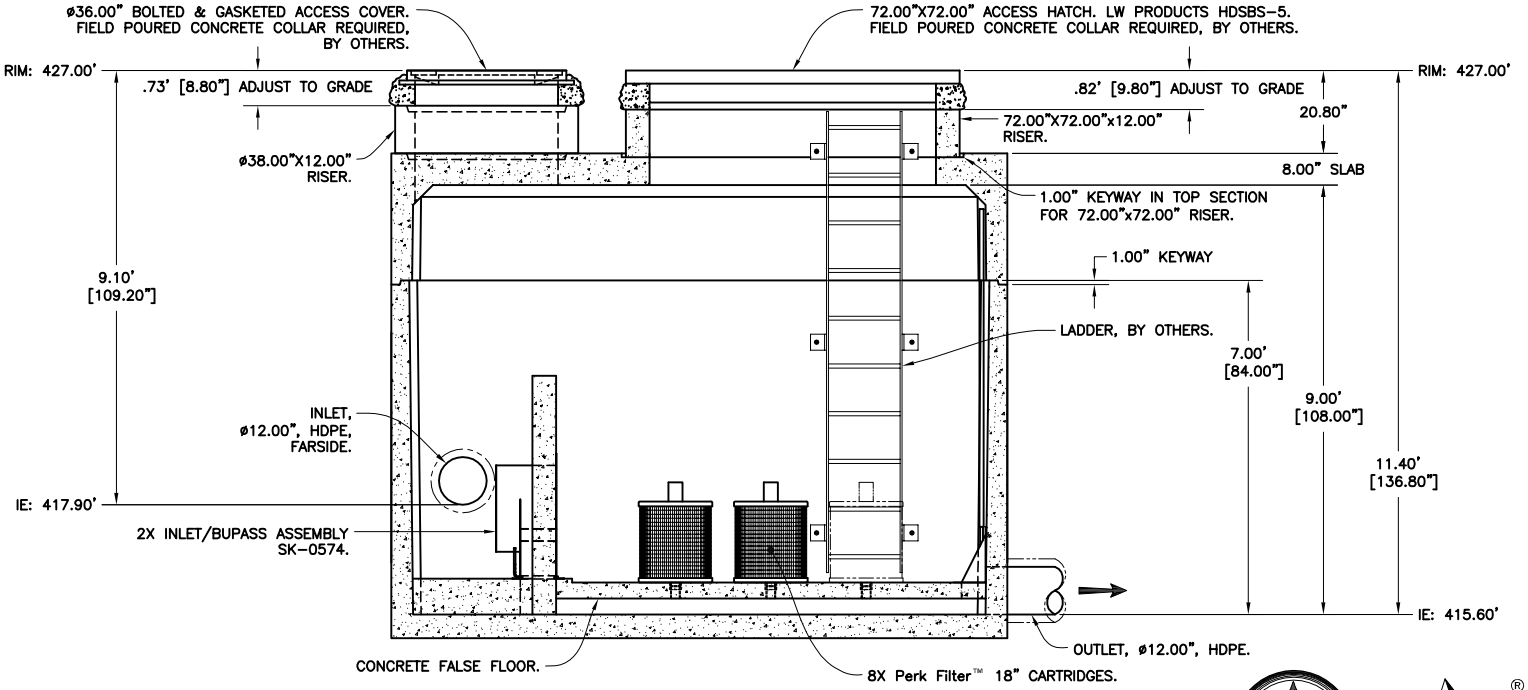
Perk Filter™ Vault - 6' x 12'
18" Cartridges, 8 Each

Treatment Flow Rate
81.6 gpm / 0.182 cfs

PDD-7303



PLAN VIEW



SECTION A-A

NOTES:

1. CONCRETE COMPONENTS ARE DESIGNED FOR HS-20 TRUCK LIVE LOAD AND MANUFACTURED IN ACCORDANCE WITH ASTM C890 & C913.
2. DESIGN FILL RANGE 6"(MIN) TO 2'(MAX)
3. GROUND WATER TABLE FOR STRUCTURAL CALCULATIONS IS ASSUMED BELOW INVERT.
4. DESIGN CONCRETE COMPRESSIVE STRENGTH IS 5,000 PSI (MIN.) AT 28 DAYS.
5. PRECAST DESIGN DOES NOT INCLUDE ANY LATERAL OR SURCHARGE LOADS FROM OTHER BUILDINGS OR FOUNDATIONS ADJACENT TO THIS STRUCTURE. THIS STRUCTURE SHALL BE KEPT A MINIMUM OF 1:1 RATIO AWAY FROM OTHER FOOTINGS OR FOUNDATIONS.
6. THIS STRUCTURE IS DESIGNED TO THE PARAMETERS NOTED HEREIN. PLEASE VERIFY THAT THESE PARAMETERS MEET PROJECT REQUIREMENTS (I.E. LIVE LOAD, FILL RANGE, WATER TABLE). IF DESIGN PARAMETERS ARE INCORRECT, REVIEWING ENGINEER/AUTHORITY SHALL NOTIFY OLDCASTLE PRECAST UPON REVIEW OF THIS SUBMITTAL.
7. OVERSIZED HOLES TO ACCOMMODATE SPECIFIC PIPE TYPE MUST BE CONCENTRIC TO PIPE ID. AFTER PIPES ARE INSTALLED, ALL ANNULAR SPACES SHALL BE FILLED WITH A MINIMUM OF 3000 PSI CONCRETE FOR FULL THICKNESS OF PRECAST WALLS.
8. MAXIMUM PICK WEIGHT: BASE SECTION = ~30,500 LBS / 15.25 TONS. (BASE SECTION, ASSEMBLED WITH CARTRIDGES INSTALLED).
9. SECTION HEIGHTS, SLAB THICKNESSES & KEYWAYS ARE SUBJECT TO CHANGE DUE TO AVAILABILITY & PRODUCTION PLANT CAPABILITY.

Media Filtration

KRISTAR®

Oldcastle Precast®
360 Sutton Place, Santa Rosa, CA 95407
Ph: 800.579.8819, Fax: 707.524.8186, www.oldcastle.com

Perk Filter Vault - 6' x 12'
18" Cartridges, 8 Each

Customer:
Mead & Hunt, Inc.

Job Name:
Jazz Run - Issaquah, WA

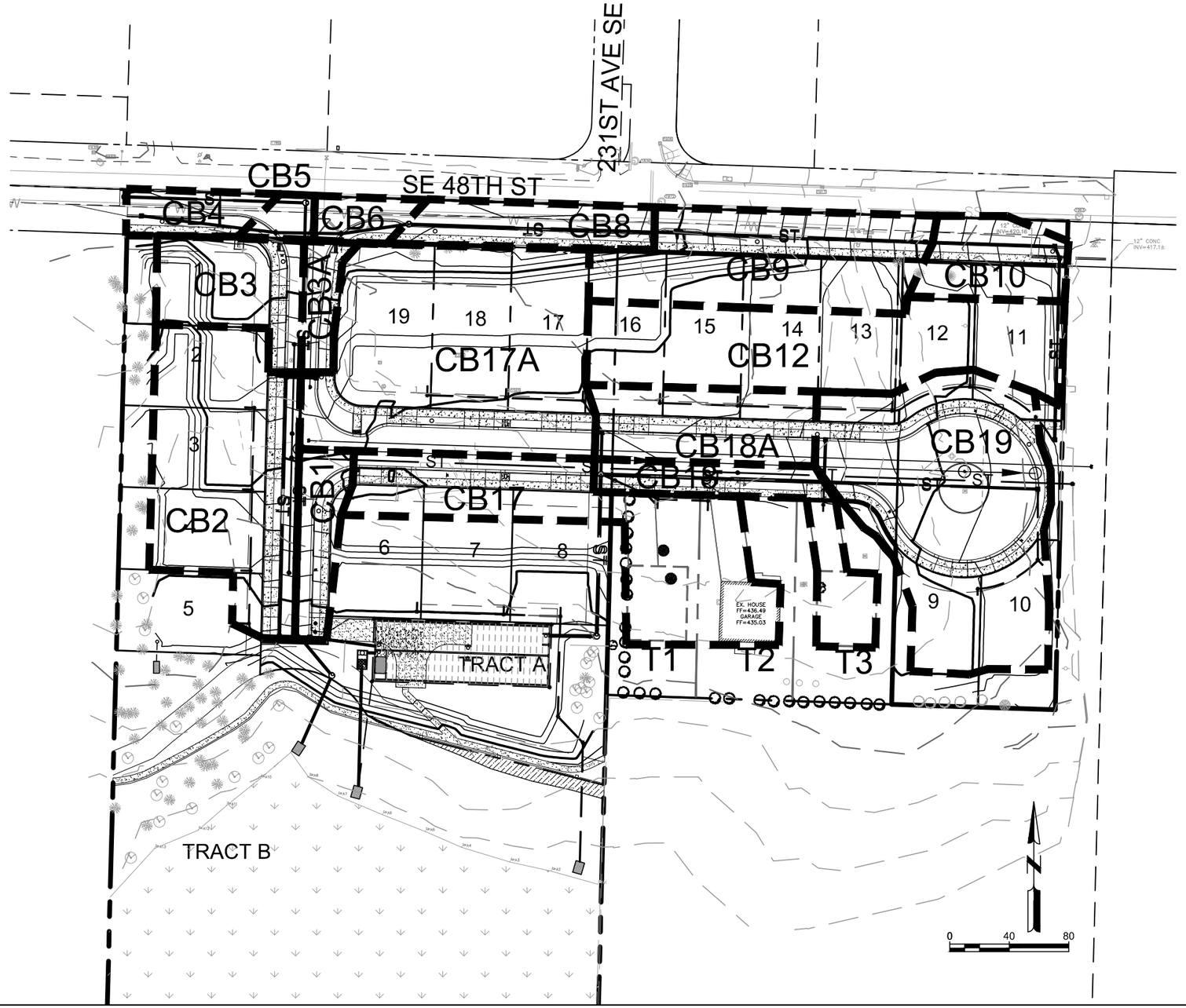
JOB DATE	SALES	DRAWN	ENGINEER	CHECKED	SALES ORDER
7/7/15	XXX	JPR	JMH	ISM / SRA	X

DRAWING NUMBER	REVISION	SHEET
PDD-7303	P01	1 OF 1
	REV DATE: N/A	

REV.	ECO NO.	DESCRIPTION	APPROVED
P01	NONE	NEW.	N/A

6. Conveyance System Analysis and Design

Conveyance capacity calculations have been prepare for each pipe network for both the 25-yr and 100-yr return events using the Rational Method as outlined in the King County SWDM Section 3.2.1. The Hydraflow Storm Sewers software program (from Autodesk Civil 3D) was used to calculate hydraulic grade lines and pipe capacities for each network. Printouts showing results for each network are included at the end of this Section. The new pipe system have sufficient capacity to convey and contain the 25-year and the 100-year peak flows without overtopping any of the catch basins.



CONVEYANCE BASIN AREAS

CB1	0.08 (ACRES - TYPICAL)
CB2	0.40
CB3	0.15
CB3A	0.05
CB4	0.06
CB5	0.03
CB6	0.04
CB8	0.11
CB9	0.31
CB10	0.12
CB12	0.41
CB17	0.38
CB17A	0.57
CB18	0.15
CB18A	0.17
CB19	0.54

Mead & Hunt

JAZZ RUN SUBDIVISION

EXHIBIT 6.1

CONVEYANCE BASINS MAP

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Jazz Run Subdivision

19-lot subdivision

Conveyance Design Peak Rate Calculations - Rational Method

(using the Rational Method as outlined in 2009 King County Manual)

25-year Event Peak Rates

Basin	Area	Area	A_I	A_P	C	L	kR	S	V	Tt	Tc	a_R	b_R	I_R	A	Q
	(sf)	(ac)	(C=0.90)	(C=0.25)	composite	ft									total	(cfs)
CB1	3640	0.08	0.08	0.00	0.90	120	20.1	0.120	7.0	0.29	6.3	2.66	-0.65	3.70	0.08	**0.27**
CB2	17360	0.40	0.35	0.05	0.82	175	20.1	0.120	7.0	0.42	6.3	2.66	-0.65	3.70	0.40	**1.21**
CB3	6520	0.15	0.12	0.03	0.77	100	20.1	0.120	7.0	0.24	6.3	2.66	-0.65	3.70	0.15	**0.43**
CB3A	2150	0.05	0.05	0.00	0.90	100	20.1	0.120	7.0	0.24	6.3	2.66	-0.65	3.70	0.05	**0.17**
CB4	2710	0.06	0.06	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.66	-0.65	3.70	0.06	**0.20**
CB5	1110	0.03	0.03	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.66	-0.65	3.70	0.03	**0.10**
CB6	1890	0.04	0.04	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.66	-0.65	3.70	0.04	**0.13**
CB8	4915	0.11	0.11	0.00	0.90	170	20.1	0.020	2.8	1.00	6.3	2.66	-0.65	3.70	0.11	**0.37**
CB9	13380	0.31	0.16	0.15	0.59	180	20.1	0.140	7.5	0.40	6.3	2.66	-0.65	3.70	0.31	**0.67**
CB10	5010	0.12	0.07	0.05	0.63	90	20.1	0.090	6.0	0.25	6.3	2.66	-0.65	3.70	0.12	**0.28**
CB12	17650	0.41	0.35	0.06	0.80	100	20.1	0.020	2.8	0.59	6.3	2.66	-0.65	3.70	0.41	**1.22**
CB16	47920	1.10	0.60	0.50	0.60	160	20.1	0.020	2.8	0.94	6.3	2.66	-0.65	3.70	1.10	**2.46**
CB17	16485	0.38	0.25	0.13	0.68	160	20.1	0.020	2.8	0.94	6.3	2.66	-0.65	3.70	0.38	**0.95**
CB17A	24990	0.57	0.40	0.17	0.71	160	20.1	0.020	2.8	0.94	6.3	2.66	-0.65	3.70	0.57	**1.49**
CB18	6365	0.15	0.15	0.00	0.90	150	20.1	0.060	4.9	0.51	6.3	2.66	-0.65	3.70	0.15	**0.50**
CB18A	7480	0.17	0.17	0.00	0.90	150	20.1	0.060	4.9	0.51	6.3	2.66	-0.65	3.70	0.17	**0.57**
CB19	23585	0.54	0.50	0.04	0.85	150	20.1	0.060	4.9	0.51	6.3	2.66	-0.65	3.70	0.54	**1.70**

100-year Event Peak Rates

Basin	Area	Area	A_I	A_P	C	L	kR	S	V	Tt	Tc	a_R	b_R	I_R	A	Q
	(sf)	(ac)	(C=0.90)	(C=0.25)	composite	ft									total	(cfs)
CB1	3640	0.08	0.08	0.00	0.90	120	20.1	0.120	7.0	0.29	6.3	2.61	-0.63	4.09	0.08	**0.29**
CB2	17360	0.40	0.35	0.05	0.82	175	20.1	0.120	7.0	0.42	6.3	2.61	-0.63	4.09	0.40	**1.34**
CB3	6520	0.15	0.12	0.03	0.77	100	20.1	0.120	7.0	0.24	6.3	2.61	-0.63	4.09	0.15	**0.47**
CB3A	2150	0.05	0.05	0.00	0.90	100	20.1	0.120	7.0	0.24	6.3	2.61	-0.63	4.09	0.05	**0.18**
CB4	2710	0.06	0.06	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.61	-0.63	4.09	0.06	**0.22**
CB5	1110	0.03	0.03	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.61	-0.63	4.09	0.03	**0.11**
CB6	1890	0.04	0.04	0.00	0.90	50	20.1	0.020	2.8	0.29	6.3	2.61	-0.63	4.09	0.04	**0.15**
CB8	4915	0.11	0.11	0.00	0.90	170	20.1	0.020	2.8	1.00	6.3	2.61	-0.63	4.09	0.11	**0.41**
CB9	13380	0.31	0.16	0.15	0.59	180	20.1	0.140	7.5	0.40	6.3	2.61	-0.63	4.09	0.31	**0.74**
CB10	5010	0.12	0.07	0.05	0.63	90	20.1	0.090	6.0	0.25	6.3	2.61	-0.63	4.09	0.12	**0.31**
CB12	17650	0.41	0.35	0.06	0.80	100	20.1	0.020	2.8	0.59	6.3	2.61	-0.63	4.09	0.41	**1.35**
CB16	47920	1.10	0.60	0.50	0.60	160	20.1	0.020	2.8	0.94	6.3	2.61	-0.63	4.09	1.10	**2.72**
CB17	16485	0.38	0.25	0.13	0.68	160	20.1	0.020	2.8	0.94	6.3	2.61	-0.63	4.09	0.38	**1.05**
CB17A	24990	0.57	0.40	0.17	0.71	160	20.1	0.020	2.8	0.94	6.3	2.61	-0.63	4.09	0.57	**1.65**
CB18	6365	0.15	0.15	0.00	0.90	150	20.1	0.060	4.9	0.51	6.3	2.61	-0.63	4.09	0.15	**0.55**
CB18A	7480	0.17	0.17	0.00	0.90	150	20.1	0.060	4.9	0.51	6.3	2.61	-0.63	4.09	0.17	**0.63**
CB19	23585	0.54	0.50	0.04	0.85	150	20.1	0.060	4.9	0.51	6.3	2.61	-0.63	4.09	0.54	**1.88**

TABLE 3.2.1.B COEFFICIENTS FOR THE RATIONAL METHOD "iR" EQUATION

Storm	aR	bR
2 years	1.58	0.58
5 years	2.33	0.63
10 years	2.44	0.64
25 years	2.66	0.65
50 years	2.75	0.65
100 years	2.61	0.63

TABLE 3.2.1.C kR VALUES FOR Tt USING THE RATIONAL METHOD

Forest with heavy ground litter and meadow	2.6
Fallow or minimum tillage cultivation	4.8
Short grass pasture and lawns	7.1
Nearly bare ground	10.2
Grassed waterway	15.1
Paved area (sheet flow) and shallow gutter flow	20.1

$Q_R = C I_R A$ cfs

Tt = L/60V

L = flowpath

V = $kR(S)^{0.5}$

$I_R = P_R a_R (Tc)^{-b_R}$

L = flowpath

S = flowpath slope (ft/ft)

Tc = Tt (min. 6.3 minutes)

P2 = 2.6

P10 = 3.8

P25 = 4.6

P100 = 5

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	32	0.00	0.00	0.00	0.00	0.00	0.0	3.3	0.0	5.21	8.04	2.95	18	0.50	420.70	420.86	423.00	423.07	0.00	426.12	SDMH1
2	1	109	0.00	0.00	0.00	0.00	0.00	0.0	2.7	0.0	5.21	8.01	2.95	18	0.50	420.96	421.50	423.20	423.43	426.12	438.20	PIPE 17
3	2	150	0.00	0.00	0.00	0.00	0.00	0.0	1.1	0.0	2.77	8.04	1.57	18	0.50	421.50	422.25	423.63	423.72	438.20	434.69	PIPE 18
4	3	144	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.70	2.75	2.16	12	0.51	422.25	422.98	423.78	424.06	434.69	426.18	PIPE 19
5	2	28	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.49	2.82	3.64	12	0.54	434.70	434.85	435.22	435.37	438.20	438.05	PIPE 17A
6	3	28	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.57	2.82	2.76	12	0.54	431.07	431.22	431.37	431.53	434.69	434.50	PIPE 18A

Jazz Run Road A 25yr Conv | Number of lines: 6 | Run Date: 8/7/2015

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	32	0.00	0.00	0.00	0.00	0.00	0.0	3.0	0.0	5.76	8.04	3.26	18	0.50	420.70	420.86	424.00	424.08	0.00	426.12	SDMH1
2	1	109	0.00	0.00	0.00	0.00	0.00	0.0	2.4	0.0	5.76	8.01	3.26	18	0.50	420.96	421.50	424.25	424.53	426.12	438.20	PIPE 17
3	2	150	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	3.06	8.04	1.73	18	0.50	421.50	422.25	424.77	424.88	438.20	434.69	PIPE 18
4	3	144	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.88	2.75	2.39	12	0.51	422.25	422.98	424.95	425.30	434.69	426.18	PIPE 19
5	2	28	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.65	2.82	3.73	12	0.54	434.70	434.85	435.25	435.40	438.20	438.05	PIPE 17A
6	3	28	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.63	2.82	2.84	12	0.54	431.07	431.22	431.39	431.55	434.69	434.50	PIPE 18A

Jazz Run Road A ~~20yr Conv~~ 100 yr

Number of lines: 6

Run Date: 8/7/2015

NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	45	0.00	0.00	0.00	0.00	0.00	0.0	2.1	0.0	2.08	6.43	5.70	12	2.78	422.64	423.89	423.03	424.51	0.00	427.19	PIPE 1
2	1	20	0.00	0.00	0.00	0.00	0.00	0.0	2.0	0.0	1.81	2.86	3.72	12	0.55	423.89	424.00	424.51	424.57	427.19	426.99	PIPE 2
3	2	174	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	0.60	11.77	1.77	12	9.31	424.00	440.20	424.92	440.52	426.99	443.48	PIPE 3
4	3	20	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.17	2.73	1.03	12	0.50	440.20	440.30	440.52	440.53	443.48	443.50	PIPE 3A

Jazz Run Road B 25 yr

Number of lines: 4

Run Date: 8/7/2015

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	45	0.00	0.00	0.00	0.00	0.00	0.0	2.0	0.0	2.28	6.43	3.58	12	2.78	422.64	423.89	424.00	424.54	0.00	427.19	PIPE 1
2	1	20	0.00	0.00	0.00	0.00	0.00	0.0	1.9	0.0	1.99	2.86	3.85	12	0.55	423.89	424.00	424.54	424.61	427.19	426.99	PIPE 2
3	2	174	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	0.65	11.77	1.82	12	9.31	424.00	440.20	424.98	440.54	426.99	443.48	PIPE 3
4	3	20	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.18	2.73	1.02	12	0.50	440.20	440.30	440.54	440.54	443.48	443.50	PIPE 3A

Jazz Run Road B 100yr | Number of lines: 4 | Run Date: 8/7/2015

NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	37	0.00	0.00	0.00	0.00	0.00	0.0	4.7	0.0	2.97	8.74	4.28	12	5.14	417.10	419.00	419.00	419.74	0.00	421.58	Ex Conc
2	1	8	0.00	0.00	0.00	0.00	0.00	0.0	4.6	0.0	1.75	3.86	3.33	12	1.00	419.00	419.08	419.74	419.64	421.58	421.04	Pipe 11
3	2	87	0.00	0.00	0.00	0.00	0.00	0.0	4.1	0.0	1.47	10.77	2.75	12	7.79	417.64	424.42	419.64	424.93	421.04	428.60	Pipe 10
4	3	183	0.00	0.00	0.00	0.00	0.00	0.0	2.9	0.0	0.80	13.46	2.48	12	12.18	424.42	446.71	424.93	447.08	428.60	451.25	Pipe 9
5	4	165	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	0.43	4.16	2.05	12	1.16	446.71	448.63	447.08	448.90	451.25	453.40	Pipe 8
6	5	46	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	0.43	2.73	2.50	12	0.50	448.63	448.86	448.90	449.13	453.40	452.86	Pipe 7
7	6	44	0.00	0.00	0.00	0.00	0.00	0.0	0.9	0.0	0.30	2.73	2.00	12	0.50	448.86	449.08	449.13	449.31	452.86	452.43	Pipe 6
8	7	91	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.20	2.74	1.77	12	0.51	449.08	449.54	449.31	449.72	452.43	451.65	Pipe 5
9	1	122	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.22	5.33	2.68	12	1.91	419.00	421.33	419.74	421.80	421.58	424.53	Pipe 12

Project File: Jazz Run SE 48th 25yr Conv.stm

Number of lines: 9

Run Date: 8/7/2015

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	37	0.00	0.00	0.00	0.00	0.00	0.0	4.5	0.0	3.82	8.74	5.17	12	5.14	417.10	419.00	419.00	419.83	0.00	421.58	Ex Conc
2	1	8	0.00	0.00	0.00	0.00	0.00	0.0	4.5	0.0	1.94	3.86	3.39	12	1.00	419.00	419.08	419.83	419.67	421.58	421.04	Pipe 11
3	2	87	0.00	0.00	0.00	0.00	0.00	0.0	4.0	0.0	1.63	10.77	2.91	12	7.79	417.64	424.42	419.67	424.96	421.04	428.60	Pipe 10
4	3	183	0.00	0.00	0.00	0.00	0.00	0.0	2.8	0.0	0.89	13.46	2.57	12	12.18	424.42	446.71	424.96	447.10	428.60	451.25	Pipe 9
5	4	165	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	0.48	4.16	2.12	12	1.16	446.71	448.63	447.10	448.92	451.25	453.40	Pipe 8
6	5	46	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	0.48	2.73	2.58	12	0.50	448.63	448.86	448.92	449.15	453.40	452.86	Pipe 7
7	6	44	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	0.33	2.73	2.05	12	0.50	448.86	449.08	449.15	449.32	452.86	452.43	Pipe 6
8	7	91	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.22	2.74	1.81	12	0.51	449.08	449.54	449.32	449.73	452.43	451.65	Pipe 5
9	1	122	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.88	5.33	3.32	12	1.91	419.00	421.33	419.83	421.91	421.58	424.53	Pipe 12

Project File: Jazz Run SE 48th 100yr Conv.stm

Number of lines: 9

Run Date: 8/7/2015

NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	50	0.00	0.00	0.00	0.00	0.00	0.0	1.8	0.0	2.46	15.34	7.42	12	15.80	412.41	420.31	412.75	420.98	0.00	426.13	Pipe 13
2	1	39	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	2.46	9.45	4.39	12	6.00	420.31	422.65	420.98	423.32	426.13	427.65	Pipe 14
3	2	288	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	2.46	9.26	4.39	12	5.76	422.65	439.24	423.32	439.91	427.65	452.73	Pipe 15
4	3	122	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.46	2.73	3.93	12	0.50	439.24	439.85	439.98	440.59	452.73	451.94	Pipe 16

Jazz Run Offsite Bypass Conv 25yr

Number of lines: 4

Run Date: 8/7/2015

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	50	0.00	0.00	0.00	0.00	0.00	0.0	1.7	0.0	2.72	15.34	8.07	12	15.80	412.41	420.31	412.75	421.02	0.00	426.13	Pipe 13
2	1	39	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	2.72	9.45	4.59	12	6.00	420.31	422.65	421.02	423.36	426.13	427.65	Pipe 14
3	2	288	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	2.72	9.26	4.59	12	5.76	422.65	439.24	423.36	439.95	427.65	452.73	Pipe 15
4	3	122	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.72	2.73	3.96	12	0.50	439.24	439.85	440.06	440.67	452.73	451.94	Pipe 16

Jazz Run Offsite Bypass Conv 100yr

Number of lines: 4

Run Date: 8/7/2015

NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

7. Special Reports and Studies

A. Geotechnical/Soils

A geotechnical report has been prepared by Geogroup NW and is included at the end of this section.

B. Wetlands

The project is adjacent to two existing wetlands. Most of the site lies within the contributing basin area of a wetland to the south; a smaller portion drains to an existing roadside ditch that travels through a wetland to the east of the project. A wetland analysis and mitigation report has been prepared for this project by Altmann Oliver Associates, LLC and is included at the end of this section.

Mead & Hunt has prepared monthly and daily estimations of volume discharge to each wetland. The analysis only assesses impacts from changes due to the Jazz Run subdivision. Several other developments have been recently constructed or are approved for construction that encompass the full perimeter of the wetland south of the project. A regional high-flow bypass conveyance was recently installed within that wetland to help protect steeper watercourse channels downstream. That system takes higher flows from the wetland and helps to reduce high level fluctuations. According to the Jazz Run project biologist (John Altmann of Altmann Oliver Associates), the existing vegetation within both wetlands is not sensitive to severe fluctuations in water level elevation.

The WWHM12 software program has been used to calculate monthly and daily volume discharges to the wetlands for both the existing and developed conditions in order to assess the potential changes in water level fluctuations and to assess total amount of water that is discharged to the wetland. This analysis takes into account groundwater flow by connecting pervious surfaces to the Point of Compliance for both the existing and developed conditions. Printouts of the results are included at the end of this section for review. The results show that volumes will be increased for the southern wetland and decreased for discharge to the wetland ditch to the east.

Discharge volumes to the southern wetland for the developed condition are modeled to exceed those for the existing condition throughout all time periods except July (there is essentially no change for July). This indicates that wetland will not become under-hydrated as a result of the Jazz Run development. Higher volumes of runoff are considered beneficial because water level fluctuations will be mitigated by the ELS overflow connection and because the existing vegetation is tolerant of significant fluctuations. Level fluctuations are also not anticipated to be impacted detrimentally because the wetland slopes continuously to the outlet (this is not a pothole/depression type wetland). Unlike a pothole, the outlet rate is variable (increases) with depth of flow, which helps regulate depth and reduce ponding elevation levels. The ELS high-flow bypass system inlet serves to reduce extremely high water levels within the wetland.

As mentioned above, discharge from the site to the east is to a roadside ditch within a wetland. Runoff from the site does not appreciably contribute directly to the wetland vegetation in that area except at the lowest locations adjacent to the ditch. Runoff analysis shows that total runoff volumes will be decreased to the ditch. This is not considered to be detrimental for the reason mentioned above.

Wetlands Fluctuation for POC 1
Average Annual Volume (acft)

Month	Predevel	Mitigated	Percent	Pass/Fail
Jan	69.9417	84.0179	120.1	Fail
Feb	53.1861	60.0712	112.9	Pass
Mar	46.0091	51.5282	112.0	Pass
Apr	29.2569	31.8505	108.9	Pass
May	16.4836	18.1614	110.2	Pass
Jun	12.4390	14.7343	118.5	Fail
Jul	8.6712	8.5463	98.6	Pass
Aug	8.1897	10.7548	131.3	Fail
Sep	8.6737	14.5324	167.5	Fail
Oct	15.3403	32.5460	212.2	Fail
Nov	42.0295	71.4819	170.1	Fail
Dec	61.9413	81.9217	132.3	Fail

WWHM12 Pass or Fail Criteria in this analysis is:
Monthly +/- 15% volume differential
Daily +/- 20% volume differential

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	2.4029	2.9242	121.7	Fail
2	2.1417	2.8292	132.1	Fail
3	2.1263	2.5691	120.8	Fail
4	2.4406	2.9070	119.1	Pass
5	2.3915	2.9302	122.5	Fail
6	2.5814	3.1855	123.4	Fail
7	2.2856	3.0325	132.7	Fail
8	2.3172	2.7749	119.8	Pass
9	2.0351	2.5223	123.9	Fail
10	1.8945	2.2106	116.7	Pass
11	2.0514	2.4687	120.3	Fail
12	2.2206	2.6158	117.8	Pass
13	2.6064	3.1585	121.2	Fail
14	2.4842	3.0993	124.8	Fail
15	2.2780	2.7710	121.6	Fail
16	2.3035	2.6859	116.6	Pass
17	2.3192	2.5927	111.8	Pass
18	2.4890	2.9367	118.0	Pass
19	2.4003	2.8647	119.3	Pass
20	2.2198	2.7649	124.6	Fail
21	2.0794	2.4766	119.1	Pass
22	2.3461	2.7699	118.1	Pass
23	2.5176	3.1628	125.6	Fail
24	2.2211	2.6585	119.7	Pass
25	1.9996	2.3079	115.4	Pass
26	2.0178	2.2402	111.0	Pass
27	2.0133	2.2345	111.0	Pass
28	2.1769	2.4782	113.8	Pass
29	2.2914	2.7458	119.8	Pass
30	2.3247	2.7390	117.8	Pass
31	2.1652	2.6206	121.0	Fail
Feb1	2.0094	2.3000	114.5	Pass
2	1.7969	1.9252	107.1	Pass
3	1.7977	2.0407	113.5	Pass
4	1.5782	1.6778	106.3	Pass
5	1.7966	1.8300	101.9	Pass
6	1.8631	2.0570	110.4	Pass
7	2.2602	2.4633	109.0	Pass
8	2.1442	2.4293	113.3	Pass
9	1.8327	2.1030	114.7	Pass

7	1.0949	1.2095	110.5	Pass
8	1.1633	1.2850	110.5	Pass
9	1.0066	1.0635	105.7	Pass
10	1.0088	1.1544	114.4	Pass
11	0.9851	1.1210	113.8	Pass
12	1.0709	1.1946	111.5	Pass
13	0.9868	1.1444	116.0	Pass
14	0.9126	0.9381	102.8	Pass
15	1.0788	1.2168	112.8	Pass
16	1.0442	1.2191	116.7	Pass
17	0.8186	0.7714	94.2	Pass
18	1.1226	1.1376	101.3	Pass
19	0.9921	1.2371	124.7	Fail
20	0.8001	0.8204	102.5	Pass
21	0.8608	0.7780	90.4	Pass
22	1.0085	1.1116	110.2	Pass
23	0.8422	1.0191	121.0	Fail
24	0.7326	0.7502	102.4	Pass
25	0.6539	0.6002	91.8	Pass
26	0.7703	0.8856	115.0	Pass
27	0.6813	0.8058	118.3	Pass
28	0.7654	0.7669	100.2	Pass
29	0.7910	0.9546	120.7	Fail
30	0.7767	0.8289	106.7	Pass
May1	0.6844	0.8137	118.9	Pass
2	0.6056	0.6296	104.0	Pass
3	0.6347	0.5830	91.9	Pass
4	0.6425	0.7285	113.4	Pass
5	0.6432	0.6757	105.1	Pass
6	0.5757	0.5791	100.6	Pass
7	0.5226	0.5345	102.3	Pass
8	0.5147	0.4663	90.6	Pass
9	0.5270	0.5101	96.8	Pass
10	0.5827	0.7432	127.5	Fail
11	0.4925	0.4090	83.1	Pass
12	0.5198	0.5648	108.7	Pass
13	0.5635	0.6590	116.9	Pass
14	0.5155	0.5294	102.7	Pass
15	0.4908	0.5483	111.7	Pass
16	0.4784	0.4679	97.8	Pass
17	0.4986	0.5240	105.1	Pass
18	0.5522	0.6418	116.2	Pass
19	0.4875	0.5915	121.3	Fail
20	0.4479	0.4464	99.7	Pass
21	0.4367	0.4104	94.0	Pass
22	0.4754	0.5001	105.2	Pass
23	0.4690	0.5647	120.4	Fail
24	0.4126	0.4356	105.6	Pass
25	0.4940	0.5749	116.4	Pass
26	0.4423	0.6003	135.7	Fail
27	0.4464	0.5102	114.3	Pass
28	0.5127	0.5896	115.0	Pass
29	0.5321	0.7085	133.2	Fail
30	0.5058	0.7915	156.5	Fail
31	0.4809	0.5550	115.4	Pass
Jun1	0.4703	0.5908	125.6	Fail
2	0.5351	0.6539	122.2	Fail

30	0.2245	0.1734	77.3	Fail
31	0.2471	0.2570	104.0	Pass
Aug1	0.2651	0.2584	97.5	Pass
2	0.2695	0.3414	126.7	Fail
3	0.2357	0.2146	91.0	Pass
4	0.2145	0.1900	88.6	Pass
5	0.2802	0.3077	109.8	Pass
6	0.2822	0.3358	119.0	Pass
7	0.2122	0.2466	116.2	Pass
8	0.2691	0.3095	115.0	Pass
9	0.2141	0.2055	96.0	Pass
10	0.2294	0.2117	92.3	Pass
11	0.2246	0.1986	88.4	Pass
12	0.2142	0.1928	90.0	Pass
13	0.2964	0.3183	107.4	Pass
14	0.3012	0.4744	157.5	Fail
15	0.2344	0.3541	151.0	Fail
16	0.2432	0.2907	119.5	Pass
17	0.3035	0.4008	132.1	Fail
18	0.2820	0.3968	140.7	Fail
19	0.2271	0.3381	148.9	Fail
20	0.2812	0.3274	116.4	Pass
21	0.3105	0.4793	154.4	Fail
22	0.3767	0.5828	154.7	Fail
23	0.3107	0.6222	200.2	Fail
24	0.2662	0.5088	191.2	Fail
25	0.2907	0.4670	160.6	Fail
26	0.2946	0.4354	147.8	Fail
27	0.2569	0.3823	148.8	Fail
28	0.2855	0.3866	135.4	Fail
29	0.2298	0.3798	165.3	Fail
30	0.2411	0.3403	141.2	Fail
31	0.2677	0.3714	138.7	Fail
Sep1	0.2696	0.4124	153.0	Fail
2	0.2518	0.3532	140.2	Fail
3	0.2853	0.4510	158.1	Fail
4	0.2340	0.3153	134.7	Fail
5	0.2814	0.4066	144.5	Fail
6	0.2005	0.2565	127.9	Fail
7	0.2761	0.3530	127.8	Fail
8	0.2357	0.3958	168.0	Fail
9	0.3106	0.4467	143.8	Fail
10	0.2449	0.4519	184.6	Fail
11	0.2027	0.2455	121.1	Fail
12	0.2303	0.2652	115.1	Pass
13	0.3108	0.4845	155.9	Fail
14	0.2463	0.3903	158.5	Fail
15	0.2746	0.3841	139.9	Fail
16	0.4610	0.8026	174.1	Fail
17	0.2904	0.7484	257.7	Fail
18	0.3229	0.6115	189.4	Fail
19	0.2986	0.5060	169.5	Fail
20	0.2662	0.4780	179.6	Fail
21	0.4054	0.6039	149.0	Fail
22	0.3346	0.7597	227.1	Fail
23	0.3221	0.6391	198.4	Fail
24	0.3035	0.5816	191.6	Fail

21	1.5206	2.4750	162.8	Fail
22	1.8470	2.6416	143.0	Fail
23	2.3335	3.3697	144.4	Fail
24	2.4181	3.4878	144.2	Fail
25	2.0201	3.1098	153.9	Fail
26	1.7771	2.8798	162.1	Fail
27	1.5360	2.1526	140.1	Fail
28	1.6551	2.3222	140.3	Fail
29	1.9257	2.6354	136.9	Fail
30	1.7893	2.6839	150.0	Fail
Dec1	1.8658	2.8111	150.7	Fail
2	2.3966	3.0698	128.1	Fail
3	1.9929	2.9102	146.0	Fail
4	1.9630	2.7555	140.4	Fail
5	1.8331	2.7133	148.0	Fail
6	1.6565	2.2014	132.9	Fail
7	1.6611	2.2254	134.0	Fail
8	1.7991	2.3465	130.4	Fail
9	2.0054	2.7869	139.0	Fail
10	2.0218	2.7761	137.3	Fail
11	2.0897	2.9371	140.5	Fail
12	2.1105	2.7855	132.0	Fail
13	2.1581	2.9483	136.6	Fail
14	2.5233	3.1315	124.1	Fail
15	2.2079	2.9805	135.0	Fail
16	1.9299	2.6197	135.7	Fail
17	1.8006	2.4092	133.8	Fail
18	1.7378	2.1549	124.0	Fail
19	2.0775	2.7120	130.5	Fail
20	2.0301	2.7682	136.4	Fail
21	1.8664	2.4209	129.7	Fail
22	1.9209	2.4154	125.7	Fail
23	1.8122	2.4033	132.6	Fail
24	1.8290	2.0738	113.4	Pass
25	2.2057	2.6354	119.5	Pass
26	2.3755	2.9961	126.1	Fail
27	1.8553	2.5112	135.4	Fail
28	2.0783	2.3944	115.2	Pass
29	2.4118	3.0422	126.1	Fail
30	1.9365	2.3030	118.9	Pass
31	1.9637	2.3603	120.2	Fail

Wetlands Fluctuation for POC 2
Average Annual Volume (acft)

Month	Predevel	Mitigated	Percent	Pass/Fail
Jan	27.6309	20.9609	75.9	Fail
Feb	19.6916	14.1498	71.9	Fail
Mar	16.6584	12.1110	72.7	Fail
Apr	10.0932	7.4458	73.8	Fail
May	5.4736	4.3265	79.0	Fail
Jun	4.5264	3.6497	80.6	Fail
Jul	2.6810	1.8268	68.1	Fail
Aug	3.1744	2.8959	91.2	Pass
Sep	3.9176	4.5189	115.3	Fail
Oct	9.6682	10.6396	110.0	Pass
Nov	23.9740	21.4502	89.5	Pass
Dec	27.1840	21.4814	79.0	Fail

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	0.9922	0.8993	90.6	Pass
2	0.8798	0.5623	63.9	Fail
3	0.8571	0.6889	80.4	Pass
4	0.9923	0.8232	83.0	Pass
5	0.9647	0.7044	73.0	Fail
6	1.0591	0.8556	80.8	Pass
7	0.9195	0.6315	68.7	Fail
8	0.9524	0.6943	72.9	Fail
9	0.7912	0.5915	74.8	Fail
10	0.7404	0.5464	73.8	Fail
11	0.8031	0.6034	75.1	Fail
12	0.8747	0.7582	86.7	Pass
13	1.0439	0.8958	85.8	Pass
14	0.9933	0.6896	69.4	Fail
15	0.8989	0.6414	71.4	Fail
16	0.9114	0.6580	72.2	Fail
17	0.9124	0.7218	79.1	Fail
18	0.9782	0.7156	73.2	Fail
19	0.9335	0.6689	71.7	Fail
20	0.8652	0.6076	70.2	Fail
21	0.8014	0.5968	74.5	Fail
22	0.9313	0.8150	87.5	Pass
23	1.0014	0.7736	77.3	Fail
24	0.8714	0.5518	63.3	Fail
25	0.7645	0.5218	68.3	Fail
26	0.7609	0.5384	70.8	Fail
27	0.7521	0.5514	73.3	Fail
28	0.8278	0.6732	81.3	Pass
29	0.8855	0.6453	72.9	Fail
30	0.8923	0.7395	82.9	Pass
31	0.8248	0.5385	65.3	Fail
Feb1	0.7517	0.5142	68.4	Fail
2	0.6639	0.4265	64.2	Fail
3	0.6552	0.4365	66.6	Fail
4	0.5563	0.3556	63.9	Fail
5	0.6454	0.5347	82.9	Pass
6	0.6830	0.4986	73.0	Fail
7	0.8511	0.6922	81.3	Pass
8	0.7898	0.5063	64.1	Fail
9	0.6579	0.4306	65.5	Fail

7	0.3789	0.3053	80.6	Pass
8	0.4120	0.3254	79.0	Fail
9	0.3441	0.2163	62.9	Fail
10	0.3524	0.2717	77.1	Fail
11	0.3454	0.2593	75.1	Fail
12	0.3777	0.3260	86.3	Pass
13	0.3412	0.2562	75.1	Fail
14	0.3075	0.2233	72.6	Fail
15	0.3796	0.3246	85.5	Pass
16	0.3721	0.2341	62.9	Fail
17	0.2705	0.1422	52.6	Fail
18	0.4067	0.4242	104.3	Pass
19	0.3555	0.1771	49.8	Fail
20	0.2650	0.1248	47.1	Fail
21	0.2870	0.2456	85.6	Pass
22	0.3495	0.2846	81.4	Pass
23	0.2811	0.1790	63.7	Fail
24	0.2385	0.1365	57.2	Fail
25	0.2014	0.1142	56.7	Fail
26	0.2556	0.2544	99.5	Pass
27	0.2218	0.1578	71.2	Fail
28	0.2556	0.2378	93.1	Pass
29	0.2769	0.2160	78.0	Fail
30	0.2744	0.2193	79.9	Fail
May1	0.2358	0.1530	64.9	Fail
2	0.1980	0.1168	59.0	Fail
3	0.2021	0.1606	79.4	Fail
4	0.2102	0.1541	73.3	Fail
5	0.2104	0.1640	78.0	Fail
6	0.1828	0.1197	65.5	Fail
7	0.1624	0.1020	62.8	Fail
8	0.1602	0.1080	67.4	Fail
9	0.1687	0.1243	73.7	Fail
10	0.1824	0.1703	93.4	Pass
11	0.1466	0.1000	68.2	Fail
12	0.1612	0.1091	67.7	Fail
13	0.1851	0.1708	92.3	Pass
14	0.1697	0.1293	76.2	Fail
15	0.1649	0.1090	66.1	Fail
16	0.1515	0.1171	77.3	Fail
17	0.1582	0.1401	88.5	Pass
18	0.1785	0.1798	100.7	Pass
19	0.1592	0.1038	65.2	Fail
20	0.1390	0.0889	63.9	Fail
21	0.1354	0.0803	59.3	Fail
22	0.1462	0.1339	91.6	Pass
23	0.1483	0.1401	94.5	Pass
24	0.1278	0.0873	68.3	Fail
25	0.1568	0.1902	121.3	Fail
26	0.1591	0.1374	86.3	Pass
27	0.1646	0.1374	83.5	Pass
28	0.2056	0.2018	98.2	Pass
29	0.2115	0.1931	91.3	Pass
30	0.2170	0.1849	85.2	Pass
31	0.2047	0.1614	78.9	Fail
Jun1	0.1933	0.1183	61.2	Fail
2	0.2069	0.1886	91.1	Pass

30	0.0653	0.0242	37.1	Fail
31	0.0758	0.0519	68.4	Fail
Aug1	0.0814	0.0736	90.4	Pass
2	0.0971	0.0810	83.5	Pass
3	0.0778	0.0433	55.6	Fail
4	0.0681	0.0205	30.1	Fail
5	0.0950	0.0982	103.4	Pass
6	0.0947	0.1017	107.3	Pass
7	0.0698	0.0228	32.7	Fail
8	0.0896	0.0895	99.8	Pass
9	0.0690	0.0277	40.1	Fail
10	0.0715	0.0462	64.6	Fail
11	0.0684	0.0419	61.3	Fail
12	0.0639	0.0313	49.0	Fail
13	0.1089	0.1293	118.7	Pass
14	0.1303	0.1388	106.5	Pass
15	0.0943	0.0615	65.2	Fail
16	0.0967	0.0726	75.1	Fail
17	0.1260	0.1445	114.8	Pass
18	0.1098	0.1197	109.0	Pass
19	0.0847	0.0568	67.1	Fail
20	0.0998	0.1196	119.9	Pass
21	0.1137	0.1547	136.1	Fail
22	0.1652	0.2349	142.2	Fail
23	0.1511	0.1612	106.6	Pass
24	0.1375	0.1105	80.3	Pass
25	0.1499	0.1389	92.7	Pass
26	0.1344	0.1381	102.8	Pass
27	0.1097	0.0972	88.6	Pass
28	0.1225	0.1328	108.4	Pass
29	0.1148	0.0717	62.5	Fail
30	0.1028	0.0834	81.1	Pass
31	0.1072	0.1150	107.2	Pass
Sep1	0.1070	0.1184	110.6	Pass
2	0.0945	0.0983	104.0	Pass
3	0.1121	0.1386	123.6	Fail
4	0.0875	0.0798	91.2	Pass
5	0.1069	0.1354	126.6	Fail
6	0.0728	0.0428	58.8	Fail
7	0.1042	0.1312	125.9	Fail
8	0.0944	0.0863	91.4	Pass
9	0.1176	0.1726	146.8	Fail
10	0.0929	0.0977	105.1	Pass
11	0.0879	0.0515	58.6	Fail
12	0.0875	0.0828	94.7	Pass
13	0.1145	0.1754	153.2	Fail
14	0.0888	0.1019	114.8	Pass
15	0.1029	0.1361	132.3	Fail
16	0.2037	0.3546	174.1	Fail
17	0.1505	0.1595	106.0	Pass
18	0.1585	0.1972	124.4	Fail
19	0.1443	0.1684	116.7	Pass
20	0.1380	0.1339	97.0	Pass
21	0.2187	0.2916	133.3	Fail
22	0.2135	0.1798	84.2	Pass
23	0.1716	0.1779	103.6	Pass
24	0.1423	0.1656	116.4	Pass

21	0.7955	0.6183	77.7	Fail
22	0.9213	0.9627	104.5	Pass
23	1.1781	0.9995	84.8	Pass
24	1.1767	1.0076	85.6	Pass
25	0.9931	0.7276	73.3	Fail
26	0.8982	0.6319	70.3	Fail
27	0.7581	0.5734	75.6	Fail
28	0.7827	0.6623	84.6	Pass
29	0.9043	0.8236	91.1	Pass
30	0.8716	0.7455	85.5	Pass
Dec1	0.9206	0.7774	84.4	Pass
2	1.1456	1.0018	87.5	Pass
3	0.9097	0.5691	62.6	Fail
4	0.8934	0.7752	86.8	Pass
5	0.8518	0.6217	73.0	Fail
6	0.7527	0.5531	73.5	Fail
7	0.7527	0.5964	79.2	Fail
8	0.8036	0.7155	89.0	Pass
9	0.9050	0.8129	89.8	Pass
10	0.9030	0.7680	85.0	Pass
11	0.9453	0.7733	81.8	Pass
12	0.9604	0.7866	81.9	Pass
13	0.9811	0.7906	80.6	Pass
14	1.1059	0.8919	80.7	Pass
15	0.9549	0.7009	73.4	Fail
16	0.8420	0.5622	66.8	Fail
17	0.7736	0.5594	72.3	Fail
18	0.7377	0.5963	80.8	Pass
19	0.8820	0.7883	89.4	Pass
20	0.8843	0.6861	77.6	Fail
21	0.8033	0.5965	74.3	Fail
22	0.8138	0.6357	78.1	Fail
23	0.7602	0.5410	71.2	Fail
24	0.7482	0.6210	83.0	Pass
25	0.9171	0.7945	86.6	Pass
26	0.9926	0.7382	74.4	Fail
27	0.7541	0.4502	59.7	Fail
28	0.8438	0.7815	92.6	Pass
29	0.9968	0.7474	75.0	Fail
30	0.7780	0.5025	64.6	Fail
31	0.7794	0.5967	76.6	Fail

Altmann Oliver Associates, LLC

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AOA
Environmental
Planning &
Landscape
Architecture

July 29, 2015

AOA-4660

Darren Ludwigsen
Summit Homes of Washington, LLC
16000 Christensen Road, Suite 303
Tukwila, WA 98188

SUBJECT: **Final Critical Areas Study for Jazz Run Subdivision**
Parcels 222406-9098, -9126, and -9048
City of Issaquah, WA (PRE14-00008)

Dear Darren:

On July 8, 2014 I conducted an initial wetland reconnaissance on the subject property utilizing the methodology outlined in the May 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* Additional field investigations were conducted on September 29 and November 7, 2014.

One wetland (Wetland A) was identified and delineated throughout the southwestern portion of the site. The wetland boundary was subsequently surveyed and is depicted on **Drawing W1.1**.

Wetland A is part of a larger wetland system that extends off-site to the east, south, and west. The on-site portion of the wetland slopes down from north to south with most of the wetland nearly flat. Vegetation within the on-site wetland consisted of a palustrine emergent plant community dominated by monotypic reed canarygrass (*Phalaris arundinacea*) with patches of cattail (*Typha latifolia*). Hydrology within Wetland A varied from seasonally saturated near the surface along the perimeter to permanently ponded in the interior portion of the wetland.

Attachment A contains data sheets prepared for representative locations in both the upland and wetland. These data sheets document the vegetation, soils, and hydrology information that aided in the wetland boundary delineation.

Wetland A has been approved as a Category II wetland with less than 20 Habitat Points as part of the review associated with the McBride Subdivision to the east.

Category II wetlands with less than 20 Habitat Points require a standard 75-foot buffer plus 15-foot building setback per IMC 18.10.640.C.

Proposed Wetland Buffer Reduction

Due to the highly degraded condition of most of the wetland and its buffer, a buffer and wetland enhancement plan has been prepared that should significantly increase the habitat value of the buffer over current conditions. The City of Issaquah allows for the standard buffer for Category II wetlands to be reduced by a maximum of 25% per IMC 18.10.650.D.1 if the conditions of IMC 18.10.650.D.3.b are met.

The entire central and eastern portion of the wetland buffer currently consists of periodically mowed pasture area interspersed with patches of Himalayan blackberry (*Rubus armeniacus*). This degraded buffer does not currently provide a significant habitat area or provide critical stormwater storage, erosion control, or groundwater recharge functions to the wetland. The buffer does provide some limited water quality protection functions to the wetland, but the proposed stormwater facilities adjacent to the buffer would treat all collected runoff prior to discharge and this function would continue post-development.

Although the far western portion of the buffer is forested, the total area of degraded buffer is well over 40% and meets the applicability criteria of IMC 18.10.650.D.3.b.(1)(A).

As part of the proposed buffer enhancement plan, a variety of dense native trees and shrubs would be planted throughout the degraded portion of the buffer. In addition, willow cuttings would be planted throughout the reed canarygrass portion of the wetland. Implementation of the buffer enhancement plan should significantly increase the plant species and structural diversity of the buffer over current conditions and increase the overall wildlife habitat of the wetland and its buffer.

Trail in Buffer

As part of the proposed project, a pedestrian trail would be installed within the outer part of a small portion of the buffer. Pedestrian trails are allowed within wetland buffers per IMC 18.10.610.B.5 if there is no loss of buffer function and the buffer area impacted by the trail is replaced. The portion of the trail located within the buffer would be constructed within the existing pasture and would have no impact on significant vegetation.

As part of the proposed trail construction, 810 s.f. of buffer area would be impacted and replaced with 910 s.f. of additional enhanced buffer.

Monitoring, Maintenance, and Contingency

As part of the proposed project, a 5-year monitoring, maintenance, and contingency plan has been developed for the proposed enhancement area (see **Drawing W2.2**).

HYDROLOGIC ASSESSMENT

As part of the Jazz Run project, the collected stormwater from the site will be discharged into wetlands located within the area's contributing basin. Most of the runoff will be discharged into Wetland A on the subject property, with a small amount discharged into a ditch that drains into Wetland C located on the adjacent property off-site to the east.

Based on a review of the proposed stormwater plan and conversations with Don Proctor, Project Engineer with Mead & Hunt, Inc., it is my understanding that the discharge volumes into Wetland A following construction will exceed those of the existing conditions. It is also my understanding that although the volumes will increase to this wetland, the depth of ponding will not significantly increase due to the wetlands location on a slope.

The higher volumes will ensure that the wetland continues to receive hydrologic support post-construction. Vegetation within Wetland A is dominated by monotypic reed canarygrass with patches of cattail. Since these species can tolerate significant hydrologic fluctuations, any increase in discharge volume should not negatively impact existing vegetation. In addition, the proposed willow cuttings within the enhanced wetland should also benefit from increased hydrologic support.

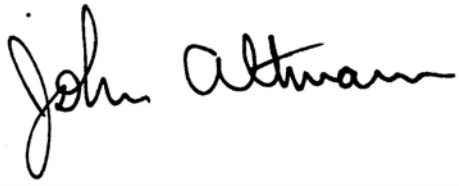
The total volume of runoff into the ditch that drains into Wetland C off-site to the east is anticipated to be less following construction. However, according to the Mead & Hunt storm report, runoff from the Jazz Run site does not appreciably contribute directly to Wetland C except at the lowest locations adjacent to the ditch.

Per the critical areas study prepared for the McBride project site, Wetland C consists of an emergent plant community dominated by grasses, soft rush, creeping buttercup, and field horsetail. Although there may be a minor reduction in hydrologic support to Wetland C, it is not anticipated to impact the existing plant community which is tolerant of water level fluctuations.

If you have any questions, please give me a call.

Sincerely,

ALTMANN OLIVER ASSOCIATES, LLC



John Altmann
Ecologist

Attachments

ATTACHMENT A
DATA SHEETS

TP #1 ~10' INTO WETLAND AT A-4

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: JAZZ RUN City/County: ISSAQUAH Sampling Date: 9/29/14

Applicant/Owner: SUMMIT HOMES State: WA Sampling Point: TP 1

Investigator(s): ALTMANN Section, Township, Range: SEC 26, T24N, R6E W.M.

Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONCAVE Slope (%): _____

Subregion (LRR): A Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY ASSUMED DUE TO DRY SEASON REVIEW

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 10'R)			
1. Phalaris arundinacea	100	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: TP 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16"	10YR 3/1	80	10YR 6/5	20			SILTY CLAY	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

LOW CHROMA WITH REDOX

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

HYDROLOGY ASSUMED BASED ON HYDRIC SOILS

TP #2 ~ 10' INTO UPLAND AT A-4

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: JAZZ RUN City/County: ISSAQUAH Sampling Date: 9/29/14

Applicant/Owner: SUMMIT HOMES State: WA Sampling Point: TP 2

Investigator(s): ALTMANN Section, Township, Range: SEC 26, T 24N, R 6E W.M.

Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONCAVE Slope (%): _____

Subregion (LRR): A Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 10'R)			
1. Phalaris arundinacea	100	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes Y No _____

Remarks:

SOIL

Sampling Point: TP 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14"	10YR 4/3	100					LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (except MLRA 1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HIGH CHROMA

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (LRR A)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (LRR A)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

TP #3 ~ 10' INTO WETLAND AT A-11

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: JAZZ RUN City/County: ISSAQUAH Sampling Date: 11/7/14

Applicant/Owner: SUMMIT HOMES State: WA Sampling Point: TP 3

Investigator(s): ALTMANN Section, Township, Range: SEC 26, T24N, R6E W.M.

Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONCAVE Slope (%): _____

Subregion (LRR): A Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 10'R)			
1. Phalaris arundinacea	100	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: TP 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15"	10YR 2/1	100					SILTY CLAY	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

LOW CHROMA

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 16'

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): SURFACE

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

TP #4 ~10' INTO UPLAND AT A-11

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: JAZZ RUN City/County: ISSAQUAH Sampling Date: 11/7/14

Applicant/Owner: SUMMIT HOMES State: WA Sampling Point: TP 4

Investigator(s): ALTMANN Section, Township, Range: SEC 26, T24N, R6E W.M.

Landform (hillslope, terrace, etc.): SLOPE Local relief (concave, convex, none): CONCAVE Slope (%): _____

Subregion (LRR): A Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20'R)	Absolute % Cover	Dominant Species?	Indicator Status
1. Thuja plicata	60	Y	FAC
2. Acer macrophyllum	20	Y	FACU
3. Pseudotsuga menziesii	20	Y	FACU
4.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10'R)			
1. Symphoricarpos albus	20	Y	FACU
2. Mahonia aquifolium	10	Y	FACU
3.			
4.			
5.			
	30	= Total Cover	
Herb Stratum (Plot size: 10'R)			
1. Polystichum munitum	25	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	25	= Total Cover	
Woody Vine Stratum (Plot size: 10'R)			
1. Rubus ursinus	10	Y	FACU
2.			
	10	= Total Cover	

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: TP 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-14"	10YR 2/2	100					LOAM	NUMEROUS ROCKS

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

CHROMA OF 2 W/O REDOX

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

GEOTECHNICAL ENGINEERING STUDY
JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

G-3778

Prepared for

Mr. Darren Ludwigsen
Summit Homes of Washington
16000 Christensen Road, Suite #303
Tukwila, Washington 98188

December 31, 2014

GEO Group Northwest, Inc.
13240 NE 20th Street, Suite 10
Bellevue, Washington 98005
Phone: (425) 649-8757 / Fax: (425) 649-8758

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists
& Environmental Scientists

December 31, 2014 G-3778

Mr. Darren Ludwigsen
Summit Homes of Washington
16000 Christensen Road, Suite #303
Tukwila, Washington 98188

Subject: Geotechnical Engineering Study
Jazz Run Proposed Subdivision
SE 48th Street, Issaquah, Washington

Dear Mr. Ludwigsen:

GEO Group Northwest, Inc. is pleased to present its geotechnical engineering study for the proposed Jazz Run Subdivision project located in Issaquah, Washington. This report presents our findings, conclusions, and recommendations regarding geotechnical aspects of the design and construction of the proposed development at the site.

We investigated the subsurface soil conditions at the site by completing six exploratory test pits and six exploratory soil borings. Based on the findings from these explorations, the subsurface soils at the site are interpreted to typically consist of an upper layer of loose to medium dense, silty sand to depths of approximately 5 feet below existing grade. These loose soils typically are underlain with silty sandstone bedrock. In the eastern part of the site and in limited areas elsewhere on site, fills up to approximately 5 feet thick were encountered. The fills in the eastern part of the site appear to have been placed to raise the elevation of the area above the nearby wetland area offsite to the east. Other fills have been placed to form parking areas and improvements associated with the existing residences on the site.

Groundwater was encountered at a depth of approximately 4 to 5 feet in test pits and borings completed in the eastern part of the site. Perched groundwater also was encountered at a depth of approximately 3 feet in a boring on the northwest part of the site (Lot 2), and at approximately 4 feet in a test pit in the southwest part of the site (Tract B).

Based on the observed shallow groundwater conditions in the eastern part of the site, and the groundwater and shallow bedrock conditions observed in the Tract B area, it is our opinion that the project site is not suitable for infiltration of stormwater. The use of shallow dispersion may be possible on the residential lots where the thickness of soils above the bedrock is sufficient to provide absorption of the stormwater.

The loose silty soils and the fills encountered in the borings are not suitable for supporting building foundations for the proposed development. We recommend that foundations be supported on the medium dense to dense native soils or underlying silty sandstone bedrock, or that they be supported on structural fill that is placed on a subgrade of competent bedrock.

We appreciate this opportunity to you with geotechnical engineering services for this project. If you have any questions regarding this report or need additional consultation, please feel free to call us.

Sincerely,

GEO Group Northwest, Inc.

William Chang

William Chang, PE
Principal

GEOTECHNICAL ENGINEERING STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
3427 – 22ND AVENUE W.
SEATTLE, WASHINGTON

G-3692

1 INTRODUCTION

GEO Group Northwest, Inc. has completed its geotechnical engineering study for the proposed Jazz Run short plat project in Issaquah, Washington, and has prepared this report of our activities, findings, analysis, conclusions, and recommendations.

1.1 Site Location and Description

The project site is located in a residential area on the northern edge of the incorporated limits of Issaquah, Washington, as illustrated in Plate 1 – Site Location Map. The north side of the site abuts SE 48th Street, which is located within the incorporated limits of Sammamish, Washington.

The project site is located on three existing land parcels. Proposed lot line adjustments will incorporate the west parcel, the east parcel, and a northern portion of the middle parcel into the proposed subdivision (the project site). The remaining southern portion of the middle parcel will be a separate parcel which is not part of the project. The site plan provided in Plate 2 – Site Plan illustrates the proposed configuration of the project site and the excluded parcel (identified as the Teunissen Parcel on the plan).

The topographic character of the site generally consists of south- and east-facing slopes with relatively flat low-lying areas on its eastern and southwestern portions. Wetland occupies much of the southwestern portion of the site. Overall elevation change across the site is about 45 feet across the narrower north-south dimension of the site (about 350 feet, excluding the wetland), and is about 35 feet across the longer east-west dimension (about 640 feet).

Some areas of the site have been modified in association with the construction of the existing residences, driveways and parking areas, yards, and pens. Slopes on the site do not exceed 40 percent inclination, and do not exhibit other characteristics that indicate they meet the criteria for steep slope or landslide hazard areas (visible seepage, evidence of past slope movement, adverse orientation of strata).

1.2 Description of Proposed Development

We understand that the proposed development of the site will consist of the demolition of the existing improvements and the construction of a 19-lot single-family residential subdivision. Two roadways will provide access to the residential lots. One road will run south from SE 48th Street across the west part of the site; a second road will run east across the site from aforementioned road. A wetland area in the southwest part of the site will be set aside as an undeveloped tract. The preliminary layout of the proposed development is illustrated in Plate 2 – Site Plan.

2 SITE INVESTIGATION

2.1 Geologic Overview

According to published geologic mapping of the area[1], the project site is underlain with sedimentary bedrock of the Tertiary-age Blakely Formation. This unit typically consists of medium- to coarse-grained sandstone, conglomerate, and minor siltstone which are massive to well-bedded and fresh to highly weathered in appearance. Exposures of this unit are noted to appear similar to strata of the underlying Puget Group and are distinguished from Puget Group units based on observation of fossils.

2.2 Subsurface Exploration

A GEO Group Northwest geologist directed the excavation of six exploratory test pits at the site on November 17, 2014. The locations of the test pits, which are identified as TP-1 through TP-6, are illustrated in Plate 2 – Site Plan. A geologist from our firm observed the excavation activities and logged the conditions encountered in the pits. Soil samples were collected for further examination and moisture content testing at our office. Copies of the test pit logs are provided in Appendix A.

A GEO Group Northwest geologist supervised the drilling of six exploratory soil borings at the site on December 8 and 9, 2014. The locations of the borings, which are identified as B-1 through B-6, are illustrated in Plate 2 – Site Plan. A geologist from our firm observed the drilling operations and logged the conditions encountered in the borings. Soil samples were collected for examination and moisture content testing, and standard penetration tests were performed at regular depth intervals. No monitoring wells or piezometers were installed in the

1 Geologic Map of the Issaquah 7.5-Minute Quadrangle, King County, Washington. U.S. Geological Survey Miscellaneous Field Studies Map MF-2206, 1992.

boreholes, and the borings were backfilled after our investigation activities were completed. Copies of the boring logs are provided in Appendix A.

2.3 Exploration Findings

Soils encountered in the explorations typically consisted of an upper layer of loose, mostly fine- to medium-grained, silty sand to sandy silt that is underlain with fine- to medium-grained silty sandstone bedrock. The transition between the soils and the bedrock typically is rather gradual, as the soils are derived from the bedrock. An exception to this typical condition was that imported granular fills were found at test pits TP-1 and TP-2 and at boring B-6 in the low-lying eastern part of the site, and at boring B-5 in the eastern part of the upland area of the site. Fills that appeared to be reworked site soils were found at test pits TP-5 and TP-6 in the southern part of the site. Also, a thin layer of glacial till soil was found below fills and on top of the bedrock at boring B-6 in the low-lying, northeast part of the site. The findings for the test pits and borings are summarized in the following table.

Summary of Subsurface Conditions in Explorations

Exploration ID	Location	Final Depth (ft)	Loose Soil Thickness (ft)	Depth to Dense Soil/Bedrock (ft)	Depth to Ground Water (ft)
TP-1	E end, Road A	5.5	Fill to 5'	NE	Groundwater @ 5'
TP-2	E end, Road A	5.5	Fill to 4'	NE	Groundwater @ 5'
TP-3	Lot 10	5	5	NE	Groundwater @ 4.75'
TP-4	Tract B	2	1	1*	NE
TP-5	Tract B	5	Fill to 2.5'	4.5*	NE
TP-6	Tract B	5	Fill to 1.5'	5*	Groundwater @ 4'
B-1	Lot 2	11	3	5	Perched Groundwater @ 3'
B-2	Lot 4	6	5	5	NE
B-3	Lot 18	8.5	5	5	NE
B-4	Lot 8	8.5	7	7	NE
B-5	Lot 15	8	6	6	NE
B-6	Lot 12	13.5	10	10	Seepage @ 5'

Notes: NE = Not Encountered.
* = Competent due to cohesiveness.

3 SOIL INFILTRATION EVALUATION

Shallow groundwater conditions (groundwater at approximately 4 to 5 feet below ground surface) were encountered at test pits TP-1, TP-2, and TP-3, and at boring B-6 in the low-lying eastern part of the site. Fills of approximately 4 to 5 feet in thickness also were encountered in these areas. In our opinion, these conditions will not be suitable for infiltration of stormwater. Dispersion of stormwater from roof downspouts, however, may be feasible if adequate area is available on individual lots.

The soil and bedrock conditions encountered in test pits TP-4, TP-5, and TP-6 in the Tract B area in the southwest part of the site are not suitable for infiltration of stormwater, in our opinion. The soils in this area contain appreciable fines (silt and clay) and are underlain with silty sandstone bedrock at shallow depth. Perched groundwater also was observed at a depth of 4 feet in test pit TP-6.

The soil and bedrock conditions found in the borings completed on other portions of the site found soil conditions that are not suitable for full infiltration of stormwater, but may be suitable for dispersion and partial infiltration of roof downspout stormwater on individual lots. The thickness of the soils on top of the bedrock was found to be range between approximately 3 and 6 feet. Perched groundwater on top of bedrock was observed at approximately 3 feet in boring B-1 in the northwestern portion of the site, but was not observed on top of the encountered bedrock in the other borings located on the higher-elevation portions of the site. It should be noted that boring B-1 was located in a swale area which may receive and accumulate subsurface water on a fluctuating basis.

4 SITE SEISMIC DESIGN CLASSIFICATION

Per the procedures specified in the 2012 edition of the International Building Code (IBC), soil conditions across the majority of the project site can be assigned a seismic design classification of Site Class C (Soft Bedrock / Very Dense Soil).

The northeasternmost portion of the site in the location of proposed lots 11 and 12, however, should be assigned a seismic design classification of Site Class E based on the presence of 10 or more feet of weak, loose fills and soils in this area (as encountered in boring B-6). However, if the thickness of the loose soils is reduced by replacement with structural fill or if structures in this area are supported on deeper foundations (such as pipe piles), then this area can be re-assigned as Site Class C, in our opinion.

In our opinion, the site has a low susceptibility to liquefaction due to seismic events because of the very limited thickness of saturated soils found during our investigation and the silty character of those soils.

5 CONSTRUCTION RECOMMENDATIONS

Based on the results of our study, it is our opinion that the proposed development of the site should address the following geotechnical issues: Building support, retaining walls, grading and earthwork, and drainage. Specific recommendations regarding these issues are presented in the following sections of this report.

5.1 Earthwork

Erosion Control

Temporary erosion and sedimentation controls should be installed at the start of earthwork to prevent the flow of sediment-laden runoff from the site and to minimize the potential for on-site soil erosion. The temporary erosion and sediment controls should be maintained during the progress of the project until the ground disturbance activities have been completed and the disturbed areas are stabilized. Temporary erosion and sediment controls to be used for the project can include silt fences, plastic sheeting, drainage swales and check dams, detention/ settlement traps, straw blankets, hay bales, wattle rolls, or other devices as appropriate for the site conditions.

We recommend that a temporary construction entrance also should be constructed at the start of the site work. The entrance should consist of a crushed rock pad of sufficient length and width to bridge over the site soils and also provide drainage to the subgrade. To prepare the pad, the subgrade soils should be excavated to a depth of at least 12 inches and a layer of woven geotextile filter fabric, such as Mirafi 500X or equivalent, should be placed on the subgrade to provide separation of materials and pad reinforcement. Then, the pad should be constructed with 2" to 4"-diameter (minimum size) quarry spalls or ballast rock.

Grading

Under no circumstances should temporary excavation slopes be greater than the limits specified in local, state and federal government safety regulations, except as discussed below and evaluated and approved by the geotechnical engineer.

Unsupported temporary cuts in soil greater than four feet in height should be sloped no steeper than 1H:1V (Horizontal:Vertical), unless evaluated and approved by the geotechnical engineer during construction. Temporary excavations into the silty sandstone bedrock can be completed at inclinations up to approximately 0.5H:1V. If groundwater seepage or other, unanticipated, adverse soil conditions are encountered during site excavation, the geotechnical engineer should evaluate the encountered conditions and provide recommendations regarding excavation procedures and cut slope configurations as appropriate. Permanent, unreinforced, cut and fill slopes at the site should be inclined no steeper than 2H:1V.

Surface water should not be allowed to flow over the top of exposed slopes nor into excavations. During wet weather, exposed cut slopes should be covered with plastic sheeting during construction to minimize erosion. Water also should not be allowed to stand in any area where footings, slabs or pavements are to be constructed. Loose surfaces of exposed soils should be compacted or tamped to a firm condition if they are not being worked, in order to reduce the infiltration of moisture and the resultant softening.

Structural Fill

Fill material used to support foundations, floors, sidewalks, driveways, and patios, constitutes structural fill. Structural fill should conform to the requirements for material specification, placement method, and compaction criteria provided below.

Material used as structural fill should have the following characteristics:

- Be a predominantly granular material;
- Be free of organic material and other deleterious substances;
- Have a maximum particle size of three (3) inches in diameter;
- Have less than 5 percent fines (material passing a #200 sieve), if placed or exposed during wet weather.

The material should be placed at or near its optimum moisture content. The optimum moisture content is the water content in the material that enables it to be compacted to the highest dry density for a given compaction effort. Materials which contain moisture significantly greater or lesser than the optimum content cannot be effectively compacted to an acceptable dense condition.

It is anticipated that the site soils will not be suitable for use as structural fill, due to their silty character and relatively high moisture content. If structural fill is used during construction, we recommend that it be an imported material as described above.

Structural fill material should be placed in horizontal lifts not exceeding 10 inches in loose thickness, and each lift should be compacted to at least 95 percent of the material maximum density, as determined by ASTM Test Designation D-1557-91 (Modified Proctor Test). The geotechnical engineer should evaluate in advance the suitability of materials that are proposed for use as structural fill. The geotechnical engineer also should monitor the placement and compaction of structural fill for conformance with engineering recommendations and for quality assurance.

During wet weather, an imported granular material containing no more than five (5) percent fines (silt and clay-size particles passing the No. 200 mesh sieve) is recommended for use as structural fill, because it will provide uniformity in character and be relatively easy to compact to structural fill specifications.

5.2 Building Support

Based on the findings from the borings drilled for this study, the depth to suitable bearing soils on the site is anticipated to typically be approximately 5 feet, at which depth competent soils or bedrock typically were found. In the low-lying eastern part of the site, however, the depth to competent soils may reach up to approximately 10 feet.

In general, we recommend that building foundations be supported on the competent native soils or bedrock, or be supported on structural fill that has been placed on a subgrade of competent soil or bedrock. In areas where the depth to competent soils or bedrock is greater than can be feasibly excavated and replaced or where substantial groundwater is present, the proposed residences can be supported on a prepared rock pad that is lined with geotextile fabric. Details regarding these recommendations are presented later in this section of this report (following the recommendations for the foundation design parameters).

1. Excavating the building area to a depth of approximately 5 feet below existing grade to expose the competent medium dense soils, and then placing structural fill as need to reach planned footing and floor elevations; or

2. Excavating the footing locations to reach the competent medium dense soils, using open-sloped trenches (for granular structural fill) or neat vertical trenches (for lean-mix

concrete or compacted rock), and backfilling as appropriate to reach planned footing elevations.

The proposed buildings can be supported on conventional spread and column footings that bear directly on the undisturbed, medium dense, native soils; or on a prepared layer of structural fill that has been placed directly on an undisturbed, competent, native soil or bedrock subgrade.

Our recommended design criteria for conventional footing foundations constructed on native soils or structural fill are as follows:

- Allowable bearing pressure, including all dead and live loads:

  Undisturbed, medium dense to dense, native soil or bedrock (SPT 'N' value of 15 or greater), or structural fill = 2,000 psf

- Minimum depth to base of perimeter footing below adjacent exterior grade = 18 inches

- Minimum depth to bottom of interior footings below top of floor slab = 12 inches

- Minimum width of wall footings = 16 inches

- Minimum lateral dimension of column footings = 24 inches

- Estimated post-construction settlement = ½ inch

- Estimated post-construction differential settlement across building width = ½ inch

A one-third increase in the above allowable bearing pressures can be used when considering short-term transitory wind or seismic loads.

Lateral loads against the building foundations can be resisted by friction between the foundation and the supporting compacted fill subgrade or by passive earth pressure acting on the buried portions of the foundations. For the latter case, the foundations must be poured "neat" against the existing undisturbed soil or be backfilled with compacted structural fill. Our recommended parameters are as follows:

- Passive Pressure (Lateral Resistance)
  - 350 pcf, equivalent fluid weight, for structural fill or medium dense, undisturbed, native soil;
  - 300 pcf, equivalent fluid weight, for medium dense, undisturbed, native soil

- Coefficient of Friction (Friction Factor)
  - 0.35 for structural fill or undisturbed, medium dense, native soil

Building footings can be supported on structural fill if acceptable foundation bearing soils are not present at the footing subgrade elevation. The unsuitable soils should be over-excavated to reach competent soil under the observation of the geotechnical engineer. The over-excavated area below the footings should extend laterally beyond the footing edges to a distance at least equal to the depth of the over-excavated area, to properly transfer the building loads to the bearing stratum. The over-excavated area should then be lined with a durable geotextile fabric, such as Mirafi 500X or other product of similar specifications, to maintain the integrity of the fill layer and prevent it from settling into the underlying loose soils.

Alternatively, lean-mix concrete or controlled-density fill (CDF) may be placed into vertical trenches excavated directly below the footings and at least as wide as the footings. Crushed rock or quarry spalls at least 2" in size also may be used instead of concrete or CDF if placed in compacted lifts approximately 18 inches thick using a hoe-pack. Trenches that extend below a 1H:1V line projected downward from the property line should be excavated and then backfilled (using CDF, concrete, or rock) in segments approximately 10 feet in length under the observation of the geotechnical engineer.

Conventional footing foundations along the perimeter of the buildings should have footing drain systems. Our recommendations regarding footing drains are presented in Section 5.5 – Site Drainage.

5.3 Concrete Slabs-on-Grade

Concrete slabs on grade (floors, patios, walkways, etc.) should be constructed on a firm, unyielding subgrade. During preparation of the slab subgrade, any areas of the subgrade that have been disturbed by construction activity should be either re-compacted or excavated and replaced with compacted structural fill. We recommend that structural fill placed below concrete slabs on grade conform to the earthwork and grading recommendations provided in this report.

To avoid moisture build-up and potential softening of slab subgrades (and potential slab settlement or cracking), we recommend that slabs should be constructed on a sub-drainage / capillary break layer that is placed on the prepared subgrade. This layer should consist of approximately 4 inches of crushed rock or gravel and be sloped or otherwise prepared to allow drainage away from the slab area. For indoor slabs, we recommend the capillary break layer be covered with a vapor barrier layer of 10-mil plastic sheeting.

5.4 Conventional Concrete Retaining Walls

We understand that the proposed development may include retaining walls to accommodate grade changes between lots, between lots and roadways, or other related scenarios.

Permanent retaining walls which are horizontally restrained on top are considered unyielding and should be designed for a lateral earth pressure under the at-rest condition; unrestrained concrete walls that are free to rotate should be designed for an active lateral earth pressure. The following recommended parameters apply to fully drained walls and therefore do not include the effects of hydrostatic pressure on the walls.

Active Earth Pressure

Conventional reinforced concrete walls that are allowed to yield an amount equal to or greater than 0.002 times the wall height should be designed to resist an active lateral earth pressure of 35 pounds per cubic foot (pcf), imposed as an equivalent fluid pressure, for cases where ground behind the walls is level (horizontal). For 2H:1V backslopes, we recommend that an active earth pressure of 50 pcf be used. We should be consulted to provide additional recommendations regarding wall load effects if other backslopes or surcharges such as buildings or roadways, are present within a distance from the wall equal to the wall height.

At-Rest Earth Pressure

Walls supported horizontally by floor slabs are considered unyielding and should be designed for lateral earth pressure under the at-rest condition. The walls should be designed to resist a lateral rectangular earth pressure of 45 pcf, equivalent fluid weight, for cases where the ground behind the walls is level (horizontal) and wall backfill consists of free-draining material (sand, gravel, or crushed rock). For 2H:1V backslopes, we recommend that an at-rest earth pressure of 60 pcf be used. We should be consulted to provide additional recommendations regarding wall load effects if other backslopes or surcharges such as buildings or roadways, are present within a distance from the wall equal to the wall height.

Seismic Earth Pressure
8H psf, where H is the wall height, imposed as a rectangular pressure against the full height of the wall.

Passive Earth Pressure
350 pcf, equivalent fluid weight, for structural fill or medium dense, undisturbed, native soil;
300 pcf, equivalent fluid weight, for medium dense, undisturbed, native soil

Base Coefficient of Friction
0.35 for competent soils or structural fill.

To prevent the buildup of hydrostatic pressure behind permanent basement or conventional retaining walls, a vertical drain mat should be installed against the wall to facilitate drainage behind the wall. The drain mat should extend from the finished surface grade, down to the footing drain. In addition to the drain mat, a prism of clean, granular, free draining structural backfill material at least 18 inches wide should be placed against the wall. The free-draining backfill should extend downward to the bottom of the wall and be in contact with a footing drain system for the wall. These recommendations are illustrated in Plate 3 – Schematic Concrete Retaining Wall Detail.

The top 12 inches of the fill behind the wall should consist of compacted and relatively impermeable soil. This cap material can be separated from the underlying more granular drainage material by a geotextile fabric, if desired. Alternatively, the surface can be sealed with asphalt or concrete paving. The final grade should be sloped to drain away from the building wall.

The backfill in areas adjacent to concrete retaining walls should be compacted with hand held equipment (such as a jumping jack) or with a small hoe-pack. Heavy compacting machines should not be allowed within a horizontal distance to the wall equivalent to one half of the wall height, unless the walls are designed to accommodate the added surcharge.

5.5 Modular Block Retaining Walls

An alternative to conventional concrete retaining walls is to protect the cuts by using modular block walls. These walls typically can be constructed at costs that are substantially lower than for conventional concrete walls. Fills placed behind the walls can be stabilized by adding geogrid reinforcement to the fills.

If constructed, the wall should be founded on dense, native soils or bedrock, or on structural fill placed directly on the dense, native soils or bedrock. We recommend that the modular block wall be designed for the following soil parameters:

- internal angle of friction (ϕ) of 30 degrees for loose soils, 36 degrees for competent soil or bedrock or structural fill;
- total unit weight (γ) of 125 pounds per cubic foot (pcf) for soil, 135 pcf for structural fill.

The block wall should be designed for any surcharge loading due to slope inclination above the top of the wall, buildings, traffic, etc. The wall may be constructed with an inclination up to approximately 5 degrees from vertical. The block wall sections should also be designed for a minimum factor of safety (FOS) of 2.0 with respect to overturning and bearing capacity, and a minimum FOS of 2.0 with respect to sliding.

We recommend that the modular block wall system be reinforced with a geogrid product such as Tensar UX 1700, or other equivalent product that has similar long-term design tensile strength and durability. The geogrid layers should be installed at vertical intervals of two feet, and should extend into the fill area a distance equal to approximately 70 percent of the height of the reinforced slope section (e.g., for a 10 foot high wall, the length of the geogrid should be at least 7 feet from the face of the wall). Although the use of modular block walls and geogrid reinforcement will increase the stability of the slope section, the primary purpose of the block wall is to protect the face of the slope from raveling.

A drain system should be installed behind the wall to prevent the buildup of hydrostatic pressures in the fill. The drain system should consist of a layer of clean crushed rock that is at least 18 inches wide (i.e., front to back) and is placed from the base of the wall up to about 12 inches below the top of the wall. The clean crushed rock should have a maximum size of 2 inches in diameter and contain less than five percent finer than the No. 200 sieve. A 6 inch diameter, rigid, perforated Schedule 40 pipe surrounded by clean crushed rock should be placed behind the base of the wall and should be sloped to convey water to a discharge tightline. The tightline should extend from the exit from the wall backfill to an appropriate discharge facility. The upper 12 inches of fill above the drain rock and behind the top of the wall should consist of relatively impermeable soil or should be surfaced with asphalt.

5.6 Site Drainage

5.6.1 Surface Drainage

Final site grades should provide drainage away from buildings. We recommend that discharge from drainage systems be directed away from walkways or driveways to mitigate against icing of these surfaces during freezing weather.

5.6.2 Subsurface Drainage

Footing drains should be installed alongside the perimeter foundations and basement walls. The drains should consist of a four inch minimum diameter, perforated, rigid PVC drain pipe laid at the bottom of the footing or wall with the perforations facing downward. The drain line should be bedded on, surrounded by, and covered with a washed rock or gravel. The drain rock and pipe also should be wrapped with a layer of durable geotextile fabric. These recommendations are illustrated in Plate 4 – Schematic Footing Drain Detail.

The footing drain lines should be sloped at sufficient gradient to generate flow and should be tight-lined to an appropriate stormwater discharge location or collection sump system. The subsurface drainage lines should not be connected to roof downspout or other surface drainage lines.

6 LIMITATIONS

This report has been prepared for the specific proposed development of the property referred to herein as the project site. Additionally, this report has been prepared for the exclusive use of Summit Homes of Washington, and its authorized representatives or agents. We recommend that this report be included in its entirety in the project plan documents for reference during design and construction.

Our findings, conclusions, and recommendations stated herein are based upon our observations, analysis, experience, and judgment. The conclusions and recommendations are our professional opinions derived in a manner consistent with the level of care and skill ordinarily exercised by other members of the geotechnical engineering profession currently practicing under similar conditions in the local area, and within the project schedule and budget limitations. No warranty of the contents of this report is expressed or implied. In the event that site conditions are found to vary from those described in this report, GEO Group Northwest, Inc. should be notified.

Subsequently, we should review the conclusions and recommendations in this report and modify them, if appropriate.

7 ADDITIONAL SERVICES

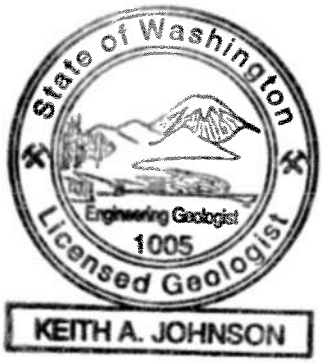
GEO Group Northwest recommends that it be retained to perform a review of the final design and specifications of the proposed development to verify that the earthwork, foundation, drainage, pavement, and other geotechnical recommendations are properly interpreted and incorporated into the design and construction documents and are appropriate for the finalized layout of the proposed development.

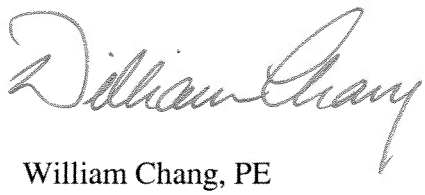
We also recommend that we be retained to provide geotechnical monitoring and testing services during construction to verify that such work is completed in compliance with the recommendations in this report and the project plans. As part of these services, will be available to discuss and recommend design changes, if needed, in the event that unanticipated site conditions are encountered or otherwise occur during construction.

Sincerely,

GEO Group Northwest, Inc.

Keith Johnson
Project Geologist





William Chang, PE
Principal Engineer

PLATES

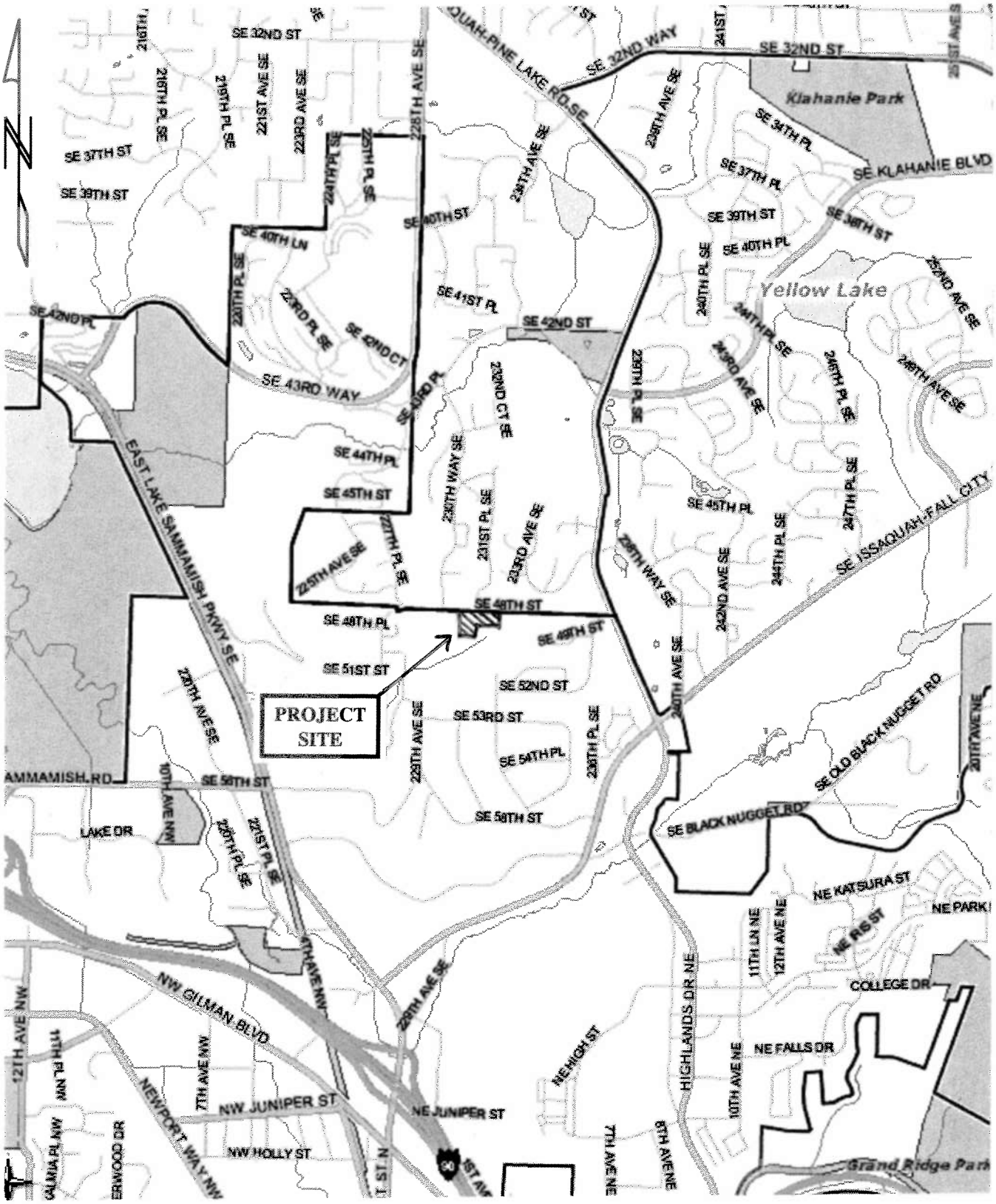
Plate 1 – Site Location Map
Plate 2 – Site Plan
Plate 3 – Schematic Concrete Retaining Wall Detail
Plate 4 – Typical Footing Drain Detail

APPENDIX A

Soil Classification Legend and Exploration Logs

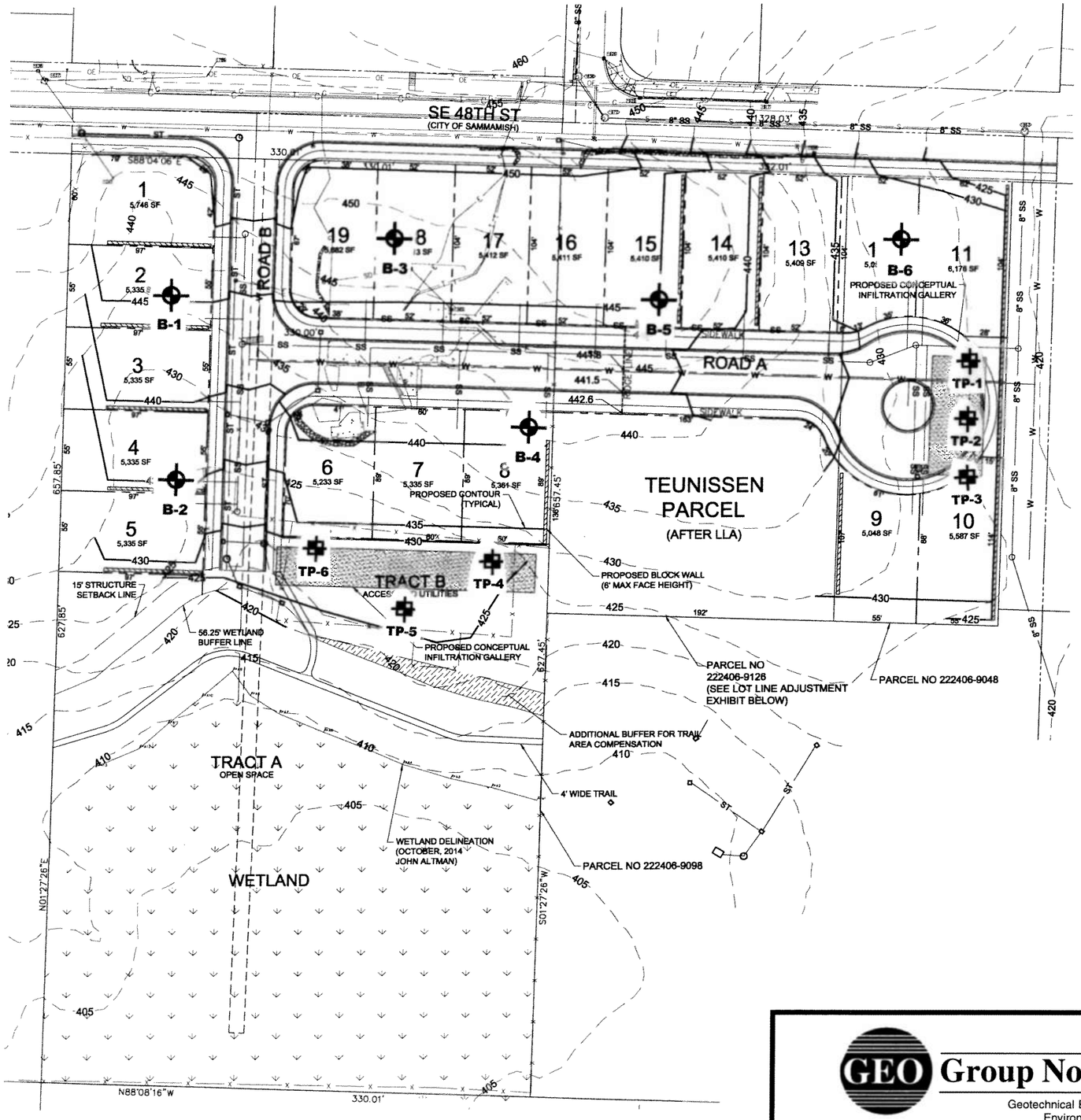
PLATES

G-3778



Source: King County GIS.

GEO Group Northwest, Inc. Geotechnical Engineers, Geologists, & Environmental Scientists									
SITE LOCATION MAP **JAZZ RUN SUBDIVISION** **SE 48TH STREET** **ISSAQUAH, WASHINGTON**									
SCALE:	1" = 2,000'	**DATE:**	12/12/2014	**MADE:**	KJ	**CHKD:**	WC	**JOB NO:**	G-3778	**PLATE**	1



Source: Proposed Lot Line Adjustment, Jazz Run Preliminary Subdivision, by Mead & Hunt, Inc., November 21, 2014.

GENERAL NOTES:

1. SITE LAYOUT AND GRADING AS SHOWN ON THIS PLAN IS CONCEPTUAL ONLY AND BASED ON PRELIMINARY INFORMATION. FINAL CONFIGURATION MAY VARY SIGNIFICANTLY PENDING PERMITTING REVIEW BY THE CITY OF ISSAQUAH.
2. LOT DIMENSIONS ARE ROUNDED TO THE NEAREST WHOLE FOOT.
3. ZONING: SF-SL
4. MINIMUM SETBACKS:

   FRONT: 10'
   SIDE: 6'
   REAR: 20'

LEGEND

TP-1 — EXPLORATORY TEST PIT (APPROXIMATE LOCATION)

B-1 — EXPLORATORY SOIL BORING (APPROXIMATE LOCATION)

0 — 80 — 160

SCALE: 1 INCH = 80 FEET

GEO Group Northwest, Inc.
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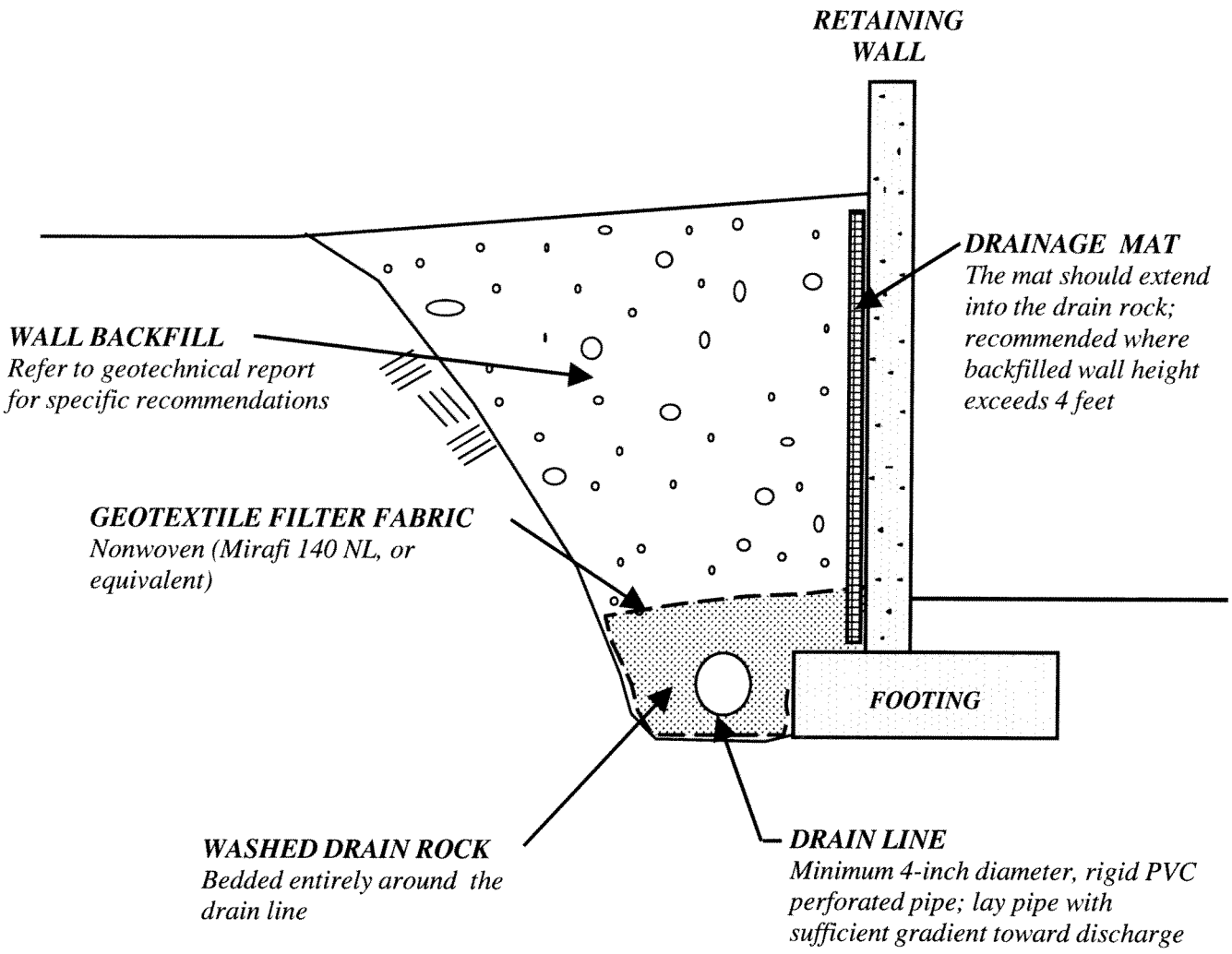
SITE PLAN

JAZZ RUN SUBDIVISION
SE 48TH STREEET
ISSAQUAH, WASHINGTON

SCALE	1" = 80'	DRAWN BY	KJ	CHECKED BY	WC	DATE	12/11/2014	PROJECT NO.	G-3778	PLATE	2



NOT TO SCALE

NOTES:

1.) Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Perforated PVC pipe should be tight jointed and laid with perforations oriented downward. The pipe should be gently sloped to provide flow toward the tightline or discharge location.

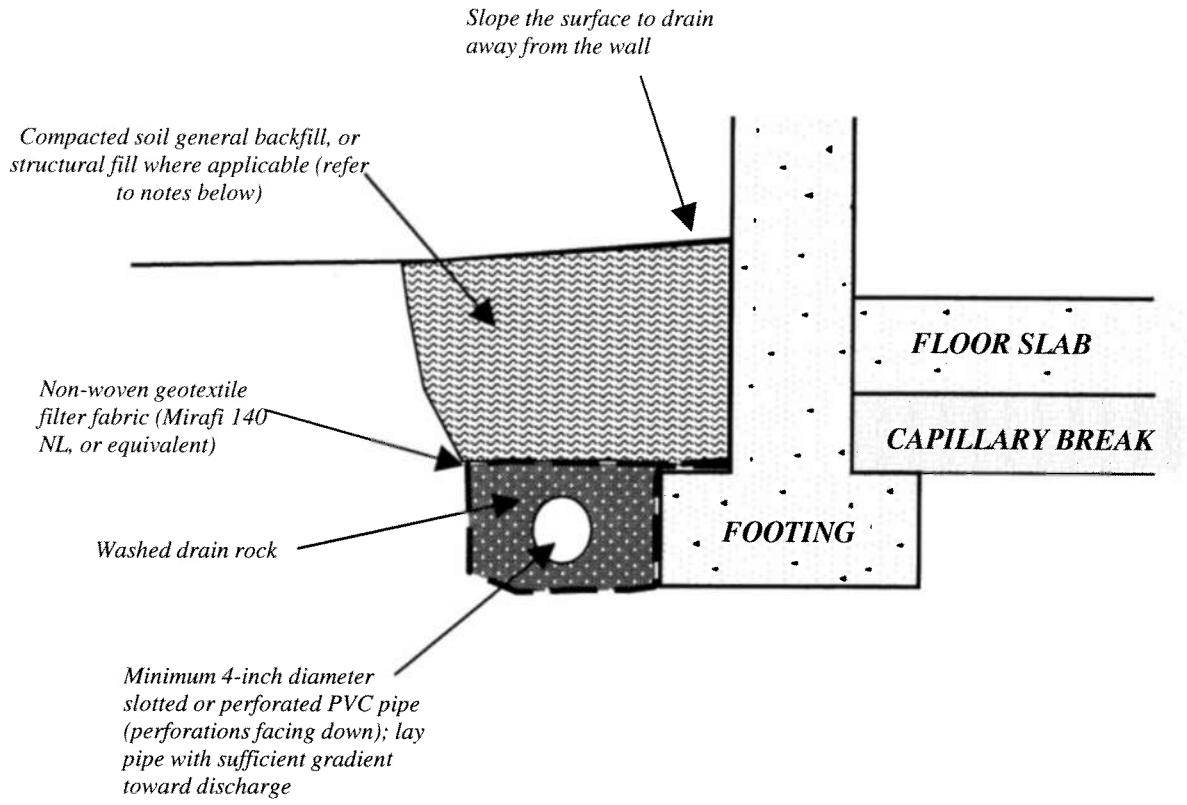
3.) Do not connect other drain lines into the footing drain system.

4.) Backfill should meet structural fill specifications if it will support driveways, sidewalks, patios, or other structures. Refer to the geotechnical engineering report for structural fill recommendations.

GEO Group Northwest, Inc. Geotechnical Engineers, Geologists, & Environmental Scientists	**SCHEMATIC CONCRETE RETAINING WALL DETAIL** **JAZZ RUN PROPOSED SUBDIVISION** **SE 48TH STREET** **ISSAQUAH, WASHINGTON**

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
NONE	12/29/2014	KJ	WC	G-3778	3

TYPICAL FOOTING DRAIN



NOT TO SCALE

NOTES:

1.) Perforated or slotted rigid PVC pipe should be tight jointed and laid with perforations or slots down, and with positive gradient toward discharge location(s). The pipe should be placed at or slightly above the elevation of the bottom of the footing. Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Do not connect other drainage lines to the footing drain lines. Drain line cleanouts should be installed at appropriate locations to allow inspection and maintenance of the lines after construction.

3.) If the backfill will support sidewalks, driveways, patios, or other structures, it should be compacted to at least 90% of its maximum dry density based on the Modified Proctor test method, except that the top 12 inches of the backfill should be compacted to at least 95% of the maximum dry density.

4.) The geotextile filter fabric should be placed around the drain rock as shown, and not wrapped directly around the pipe.

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SCHEMATIC FOOTING DRAIN
JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

SCALE: NONE	DATE: 12/29/2014	MADE: KJ	CHKD: WC	JOB NO. G-3720	PLATE 4

APPENDIX A

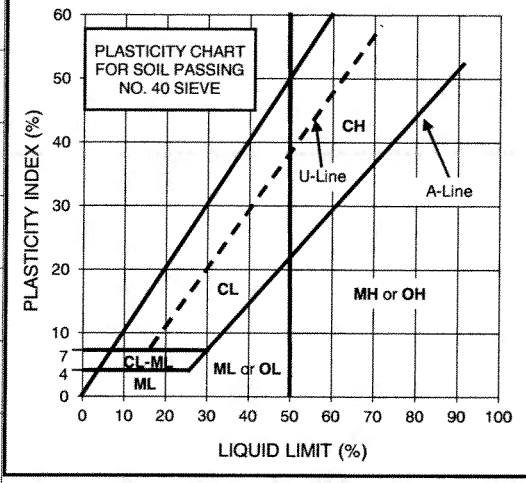
G-3778

SOIL CLASSIFICATION LEGEND AND EXPLORATION LOGS

LEGEND FOR SOIL CLASSIFICATION AND PENETRATION TEST DATA

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS	GRAVELS (More Than Half Coarse Fraction is Larger Than No. 4 Sieve)	CLEAN GRAVELS (little or no fines)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 4 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		CLEAN GRAVELS NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (with some fines)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	GM: ATTERBERG LIMITS BELOW "A" LINE, or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		GC: ATTERBERG LIMITS ABOVE "A" LINE, or P.I. MORE THAN 7
More Than Half by Weight Larger Than No. 200 Sieve	SANDS (More Than Half Coarse Fraction is Smaller Than No. 4 Sieve)	CLEAN SANDS (little or no fines)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 6 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		CLEAN SANDS NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (with some fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS	SILTS (Below A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	ML	INORGANIC SILTS, ROCK FLOUR, SANDY SILTS OF SLIGHT PLASTICITY		
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL		
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS		
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
Less Than Half by Weight Larger Than No. 200 Sieve	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS		



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE			
	Passing		Retained	
	Sieve	Size (mm)	Sieve	Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	2.00	#40	0.425
COARSE	#4	4.75	#10	2.00
GRAVEL				
FINE	0.75"	19	#4	4.75
COARSE	3"	76	0.75"	19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE FOR ENGINEERING PROPERTIES OF SOILS, BASED ON STANDARD PENETRATION TEST (SPT) DATA

SANDY SOILS				SILTY & CLAYEY SOILS		
Blow Counts N	Relative Density, %	Friction Angle ϕ, degrees	Description	Blow Counts N	Unconfined Strength Qu, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

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Geotechnical Engineers, Geologists, & Environmental Scientists
13240 NE 20th Street, Suite 10 Bellevue, WA 98005
Phone (425) 649-8757 Fax (425) 649-8758

PLATE A1

TEST PIT TP-1

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 426 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
1	SM	Grass lawn surface. Underlain with 4" to 6" very dark grayish brown rooted topsoil. SILTY SAND with minor gravel , moist, loose to medium dense, occasional small roots, mottled, relatively silty.		14.3	
2					
3					
4	SM	Dark grayish brown SILTY SAND with gravel , moist, loose to medium dense, occasional asphalt and wood debris, some gray colored soil (FILL).		14.8	
5	SM	As above.		15.2	
	ML	Very dark grayish brown SANDY SILT, relatively organic, some roots, sand is mostly fine grained, soft, moist to wet (NATIVE SOIL).			
6		Bottom of test pit at 5.5 feet below ground surface. Fill to approx. 5 feet. Water seepage observed at 5 feet.			
7					
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778	DATE 12/30/2014	PLATE A2

TEST PIT TP-2

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 426 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
	SM	Grass lawn surface. Underlain with 3" to 4" very dark grayish brown rooted topsoil.			
1	SM	Brown SILTY SAND with minor gravel , moist, loose to medium dense, very silty, occasional gray till-llike soils, trace trash debris (FILL).	■	12.9	
2					
3					
4	ML-SM	Very dark grayish brown SANDY SILT with fine organics , moist, soft, small roots (NATIVE SOIL).	■	36.1	
5	ML-SM	Red-brown SILTY SAND to SANDY SILT, very silty, fine grained, occasional organics and gravel, wet, soft.	■	30.1	
6		Bottom of test pit at 5.5 feet below ground surface. Fill to approx. 4 feet. Water seepage observed at 5 feet.			
7					
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778	DATE 12/30/2014	PLATE A3

TEST PIT TP-3

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 427 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
0		Bunch grass and weeds at surface.			
1	SM	Brown and Gray SILTY SAND with minor gravel , moist, loose to medium dense, mixed texture including topsoil (FILL).	■	17.1	
2	SM	Very dark grayish brown SILTY SAND with fine organics , moist, loose, some very small roots, 10-15% gravel (NATIVE SOIL).	■	28.3	
3					
4	ML	Yellowish brown SANDY SILT, sand is fine to medium grained, low plastic fines, slightly clayey, occasional roots and black organics, rare gravel, moist, soft.	■	52.9	
5	SM	At bottom of test pit: Yellow-orange brown SILTY SANDSTONE, very weathered , oxidized, moist, medium dense.	■	55.7	
6		Bottom of test pit at 5 feet below ground surface. Fill to approx. 1 foot. Water seepage observed at 4.75 feet.			
7					
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778	DATE 12/30/2014	PLATE A4

TEST PIT TP-4

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 424 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
1	ML	Grass field surface, with rooted topsoil to 6". Dark yellow-brown SANDY SILT , moist, loose to medium dense, sand is fine and medium grained, low plastic fines, somewhat clayey, rare gravel, oxidized (NATIVE SOIL).	■	51.4	
2	SM-ML	Orange-brown SANDSTONE to SILTSTONE , very weathered and oxidized, sand is mostly fine grained, slightly clayey, no gravel, moist, medium dense, locally stratified.	■	36.2	
3		Bottom of test pit at 2 feet below ground surface. No fill and no water seepage observed.			
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO.	G-3778	DATE	12/30/2014	PLATE	A5

TEST PIT TP-5

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 424 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
		Grass field surface with 4" of rooted topsoil.			
1	SM-ML	Dark gray-brown and yellowish brown SANDY SILT to SILTY SAND, mottled, sand is fine and medium grained, trace gravel , moist, loose mixed texture, occasional black organics (FILL).		30.2	
2	SM	Very dark grayish brown SILTY SAND, very silty , moist, loose, sand is fine and medium grained, some small roots (SUSPECTED FILL, based on texture).		29.2	
3	SM-ML	Yellowish brown SILTY SAND to SANDY SILT, sand is mostly fine grained, some clayey medium plastic fines, trace gravel, moist, soft.		55.4	
4					
5	SM-ML	At 4.5 feet: Strong brown SILTY SANDSTONE, very weathered , moist, medium dense, very silty, somewhat clayey.		58.2	
6					
7		Bottom of test pit at 5 feet below ground surface. Fill to approx. 2.5 feet. No water seepage observed .			
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778	DATE 12/30/2014	PLATE A6

TEST PIT TP-6

LOGGED BY: KJ **DATE EXCAVATED:** 11/24/2014 **GROUND ELEV:** 424 ±

DEPTH ft.	USCS	SOIL DESCRIPTION	SAMPLE No.	Water %	OTHER TESTS/ COMMENTS
0		Grass field surface with 3 to 6" of rooted topsoil.			
1	SM-ML	Dark gray-brown and yellowish brown SANDY SILT to SILTY SAND, sand is fine and medium grained, trace gravel , moist, loose , mixed texture (FILL).		38.3	
2	SM-ML	Very dark grayish brown SILTY SAND to SANDY SILT with fine organics , moist, loose, some small roots (TOPSOIL/NATIVE SOIL).			
3				30.2	
4		Yellowish brown SANDY SILT , sand is mostly fine grained, no gravel, moist, soft.			
5	SM-ML	At 4.5 feet: SILTY SANDSTONE, very weathered , moist, medium dense, very silty, slightly clayey, low and medium plastic fines.		51.0	
6		Bottom of test pit at 5 feet below ground surface. Fill to approx. 1.5 feet. Water seepage observed at 4 feet.			
7					
8					
9					
10					
11					
12					
13					

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TEST PIT LOG

JAZZ RUN PROPOSED SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO.	G-3778	DATE	12/30/2014	PLATE	A7

BORING NO. B - 1

Logged By: KJ Date Drilled: 12/8/2014 Surface Elev. 435' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
		SM	Forest duff and occasional small vines at surface. SILTY SAND, dark grayish brown, moist, loose,			1,1,3 (N=4)	42.0	
		SM	SILTY SAND, as above.			1,8,15 (N=23)	54.0	
▽		SM	SILTY SAND, yellowish brown and light brown, moist, medium dense, stratified, very oxidized and weathered (SILTY SANDSTONE)					
5		SM	SILTY SAND, light brown and olive brown, damp to moist, dense, very oxidized and weathered (SILTY SANDSTONE)			3,12,22 (N=34)	38.5	
		SM	Weakly blocky, damp to moist, dense. (SILTY SANDSTONE)			14,18,19 (N=37)	34.8	
10		SM	SILTY SAND, dark bluish gray, moist, very dense, massive texture. (SILTY SANDSTONE)			29,50-3" (N=50+)	33.8	
			Depth of boring: 11 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Perched groundwater encountered at approximately 3 to 4 feet below ground surface during drilling.					
15								
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; ▽ Water Level noted during drilling; ▼ Water Level measured at later time, as noted

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BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 **DATE** 12/11/2014 **PLATE** A8

BORING NO. B - 2

Logged By: KJ Date Drilled: 12/8/2014 Surface Elev. 425' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
		SM	Forest duff and occasional small vines at surface. SILTY SAND, very dark brown, moist, loose, contains fine organics and roots, sand is fine and medium grained.			1,2,2 (N=4)	30.8	
		SM	SILTY SAND, grayish brown, loose, moist to wet, massive texture.			2,3,6 (N=9)	34.0	
5		SM	SILTY SAND, yellowish brown and olive brown, moist, loose, stratified, very weathered and oxidized (SILTY SANDSTONE)					
		SM	SILTY SAND, strong brown and olive brown, moist, very dense, locally stratified, very oxidized, weathered (SILTY SANDSTONE)			12,26,42 (N=66)	32.0	
10			Depth of boring: 6 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Groundwater not encountered during drilling.					
15								
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

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BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 **DATE** 12/11/2014 **PLATE** A9

C:\Documents and Settings\Keith J\My Documents\A Projects\3700 thru 3999\3778 Jazz Run\G-3778 boring logs

BORING NO. B - 3

Logged By: KJ Date Drilled: 12/8/2014 Surface Elev. 447' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
		SM	Veneer of forest duff on plastic sheeting over topsoil. SILTY SAND, dark brown, moist, loose, contains fine organics, fine grained.			2,2,5 (N=7)	32.7	
		SM	SILTY SAND, dark brown, loose, as above.			3,3,5 (N=8)	45.8	
5		SM	SILTY SAND, strong brown and yellowish brown, moist, loose, stratified, very oxidized and weathered (SILTY SANDSTONE)			3,6,33 (N=39)	43.6	
		SM	SILTY SAND, yellowish brown and olive brown, damp to moist, dense, very oxidized and weathered (SILTY SANDSTONE)			24,50-5" (N=37)	34.9	
10			Damp, very dense, massive texture, oxidized and weathered (SILTY SANDSTONE).					
			Depth of boring: 8.5 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Groundwater not encountered during drilling.					
15								
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

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BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 **DATE** 12/11/2014 **PLATE** A10

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BORING NO. B - 4

Logged By: KJ Date Drilled: 12/8/2014 Surface Elev. 439' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
			Grass lawn surface.					
		SM	SILTY SAND, dark brown, moist, loose, contains fine organics, fine grained.			2,2,3 (N=5)	43.3	
		SM	SILTY SAND, brown, moist, medium dense, massive texture, oxidized and very weathered, sand is mostly grained.			3,7,8 (N=15)	38.5	
5		SM	SILTY SAND, moist, medium dense, weakly stratified, sand is mostly fine grained.			6,10,12 (N=22)	32.8	
		SM	SILTY SAND, pale brown and olive brown, damp, very dense, stratified, oxidized and weathered (SILTY SANDSTONE)			19,50-6" (N=50+)	30.9	
10			Depth of boring: 8.5 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Groundwater not encountered during drilling.					
15								
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

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BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 **DATE** 12/11/2014 **PLATE** A11

C:\Documents and Settings\Keith J\My Documents\A Projects\3700 thru 3999\3778 Jazz Run\G-3778 boring logs

BORING NO. B - 5

Logged By: KJ | Date Drilled: 12/9/2014 | Surface Elev. 450' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
			Grass lawn surface.					
		SM	SILTY SAND, dark brown, moist, loose, contains fine organics, fine grained, mottled and less silty below 12"			2,2,3 (N=5)	34.1	
		SM	Some rounded gravel with mottled yellowish brown and dark gray to dark brown fine silty sand, loose (SUSPECTED FILL).			2,2,2 (N=4)		Poor sample recovery
5		SM	SILTY SAND, yellowish brown and olive brown, damp medium dense near top to very dense at bottom, very oxidized and weathered, stratified, occasional medium to coarse sand (SILTY SANDSTONE).			6,9,50-5" (N=22)	25.4	
		SM	Very dense, damp, stratified, oxidized and weathered (SILTY SANDSTONE).			50-4" (N=50+)	19.4	
10			Depth of boring: 8 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Groundwater not encountered during drilling.					
15								
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

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BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 | **DATE** 12/11/2014 | **PLATE** A12

C:\Documents and Settings\Keith J\My Documents\A Projects\3700 thru 3999\3778 Jazz Run\G-3778 boring logs

BORING NO. B - 6

Logged By: KJ Date Drilled: 12/9/2014 Surface Elev. 429' ±

Drilled By: CN Drilling

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	SPT Blow Counts	Water Content %	Other Tests/ Comments
		SM	Grass lawn surface. SILTY SAND, grayish brown, moist, loose, very silty, no gravel, sand is fine to medium grained.			4,4,5 (N=9)	19.3	
		SM	SILTY SAND, grayish brown, very loose, moist to wet, as above but with some yellowish brown chunks (SUSPECTED FILL).			1,0,1 (N=1)	17.4	
5		SM	SILTY SAND, grayish brown, very loose, wet, organic and very dark brown/gray at bottom of sample (SUSPECTED FILL on TOPSOIL).			1,1,1 (N=2)	21.4	
		ML-SM						
		ML-SM	SILTY SAND to SANDY SILT, very dark gray, moist to wet, loose, contains fine organics (SUSPECTED TOPSOIL).			1,2,4 (N=6)	20.9	
		SM	SILTY SAND with gravel, brown, wet, loose					
10		SM	SILTY SAND with gravel, grayish brown, moist to wet, dense, massive texture, sand is mostly fine to medium grained, lens of light olive gray silt in sample.			18,15,17 (N=32)	13.2	
		SM	SILTY SAND with gravel, wet, dense.			18,35, 50-4.5" (N=85+)	13.3	
		SM	SILTY SAND, yellowish brown and olive brown, moist, very dense, weakly stratified, oxidized and weathered (SILTY SANDSTONE)					
15								
			Depth of boring: 13.5 feet. Drilling Method: Hollow-stem auger. Sampling Method: 2-inch-O.D. standard penetration sampler driven using a 140 lb. hammer with a 30-inch drop (cathead). Possible water seepage encountered at about 5 to 6 feet below ground surface during drilling.					
20								
25								

LEGEND: 2" O.D. SPT Sampler; 3" O.D. California Sampler; Water Level noted during drilling; Water Level measured at later time, as noted

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

JAZZ RUN SUBDIVISION
SE 48TH STREET
ISSAQUAH, WASHINGTON

JOB NO. G-3778 **DATE** 12/11/2014 **PLATE** A13

C:\Documents and Settings\Keith J\My Documents\A Projects\3700 thru 3999\3778 Jazz Run\G-3778 boring logs

8. Other Permits

Construction of subdivision infrastructure will be permitted through the City of Issaquah.

Construction of the wastewater collection and water distribution systems will be permitted through the Sammamish Plateau Water and Sewer District.

Improvements within SE 48th Street will be permitted by the city of Sammamish.

A Notice of Intent had been obtained through WSDOE for stormwater discharge during construction under the state's General Permit coverage.

9. Erosion Control Analysis and Design

An engineered erosion control plan will be prepared for construction permits and will be included in the final construction documents. A Construction Stormwater Pollution Prevention Plan has been prepared and is included in this Section of the report.

Stormwater Pollution Prevention Plan

For
Jazz Run Subdivision

Prepared For
Northwest Regional Office
3190 - 160th Avenue SE
Bellevue, WA 98008-5452
425-649-7000

Owner	Developer	Operator/Contractor
Summit Homes of Washington	Summit Homes of Washington	TBA
16000 Christensen Road, Suite 303	16000 Christensen Road, Suite 303	TBA
Tukwila, WA 98188	Tukwila, WA 98188	TBA

Project Site Location
23023 SE 48th St, Issaquah, WA 98029

Certified Erosion and Sediment Control Lead
Ken Tyas
(425) 508-1935

SWPPP Prepared By
Mead & Hunt
1180 NW Maple St, Suite 105
Issaquah, WA 98027
(425)369 9004
Doug Ehlebracht, Civil Engineer, EIT

SWPPP Preparation Date
April 24, 2015

Approximate Project Construction Dates
July 2015
July 2016

Contents

Appendix A Site plans

- Vicinity map (with all discharge points)
- Site plan with TESC measures

Appendix B Construction BMPs

- Possibly reference in BMPs, but likely it will be a consolidated list so that the applicant can photocopy from the list from the SWMM.

Appendix C Alternative Construction BMP list

- List of BMPs not selected, but can be referenced if needed in each of the 12 elements

Appendix D General Permit

Appendix E Site Log and Inspection Forms

Appendix F Engineering Calculations (if necessary)

- Flows, ponds, etc…

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared as part of the NPDES stormwater permit requirements for the Jazz Run subdivision project in Issaquah, Washington. Jazz Run (Project) preliminary subdivision is a proposed 19-lot single family residential subdivision on three parcels (6.82 acres total area) located on the south side of SE 48th Street at approximately 23023 SE 48th Street, in the City of Issaquah (City).

The purpose of this SWPPP is to describe the proposed construction activities and all temporary and permanent erosion and sediment control (TESC) measures, pollution prevention measures, inspection/monitoring activities, and recordkeeping that will be implemented during the proposed construction project. The objectives of the SWPPP are to:

1. Implement Best Management Practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.

2. Prevent violations of surface water quality, ground water quality, or sediment management standards.

3. Prevent, during the construction phase, adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff at the Permittee's outfalls and downstream of the outfalls.

This SWPPP was prepared using the Ecology SWPPP Template downloaded from the Ecology website on April 23, 2015. This SWPPP was prepared based on the requirements set forth in the Construction Stormwater General Permit, *Stormwater Management Manual for Western Washington* (SWMMWW 2014). The report is divided into seven main sections with several appendices that include stormwater related reference materials. The topics presented in the each of the main sections are:

- Section 1 – INTRODUCTION. This section provides a summary description of the project, and the organization of the SWPPP document.

- Section 2 – SITE DESCRIPTION. This section provides a detailed description of the existing site conditions, proposed construction activities, and calculated stormwater flow rates for existing conditions and post–construction conditions.

- Section 3 – CONSTRUCTION BMPs. This section provides a detailed description of the BMPs to be implemented based on the 12 required elements of the SWPPP (SWMMEW 2004).

- Section 4 – CONSTRUCTION PHASING AND BMP IMPLEMENTATION. This section provides a description of the timing of the BMP implementation in relation to the project schedule.

- Section 5 – POLLUTION PREVENTION TEAM. This section identifies the appropriate contact names (emergency and non-emergency), monitoring personnel, and the onsite temporary erosion and sedimentation control inspector

- Section 6 – INSPECTION AND MONITORING. This section provides a description of the inspection and monitoring requirements such as the parameters of concern to be monitored, sample locations, sample frequencies, and sampling methods for all stormwater discharge locations from the site.

- Section 7 – RECORDKEEPING. This section describes the requirements for documentation of the BMP implementation, site inspections, monitoring results, and changes to the implementation of certain BMPs due to site factors experienced during construction.

Supporting documentation and standard forms are provided in the following Appendices:

Appendix A – Site plans
Appendix B – Construction BMPs
Appendix C – Alternative Construction BMP list
Appendix D – General Permit
Appendix E – Site Log and Inspection Forms
Appendix F – Engineering Calculations

2.0 Site Description

2.1 Existing Conditions

Jazz Run subdivision project in Issaquah, Washington. Jazz Run subdivision is a proposed 19-lot single family residential subdivision on three parcels (6.82 acres total area) located on the south side of SE 48th Street at approximately 23023 SE 48th Street, in the City of Issaquah (City).

Parcels (APN 222406-9098, -9126, and -9048) are currently developed with single family residences. Approximately 2.3 acres of parcel -9098 has been designated as wetland and wetland buffer. Approximately 0.60 acres of parcel -9126 will be split off and separated from the project using the City's Lot Line Adjustment process.

Runoff from the project discharges to two separate Threshold Discharge Areas (TDAs). Runoff from the western portion of the site flows to the Lower Issaquah Creek basin to the west, eventually reaching Issaquah Creek in the vicinity of East Lake Sammamish Parkway. Runoff from the east portion of the site flows to the east into the Laughing Jacobs Creek basin and eventually reaches Lake Sammamish. Runoff to both regional basins requires additional water quality treatment phosphorus removal.

The west portion of the site discharges directly to an existing wetland within the boundary of the project. The east portion discharges to a roadside ditch along the edge of a wetland. That ditch is ponded with water during the winter.

The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) soils mapping for the project area indicates that most of the soils consist of No-Norma sandy loam and BeC – Beausite gravelly sandy loam.

2.2 Proposed Construction Activities

The Jazz Run Subdivision project will create 19 new single family residential lots with ~5,500 sf lots, pave public access roads, stormwater management systems (including collection and conveyance, flow control vault, water quality treatment vaults, and dispersal trenches), and other utilities such as sewer and water. SE 48th Street will be widened with curb, gutter and sidewalk along the project frontage.
Construction will begin with demolition and clearing only after tree protection and perimeter erosion control BMP's have been placed. Major cut and fills will then be performed to shape the site to subgrade. Then utilities will be installed (sewer, storm, water, dry utilities) followed by fine grading and construction of curbs, sidewalk, driveways, and pavements. Landscaping will be installed after planting areas have been prepared.

Drainage leaves the existing site to the south at the bottom of a mild swale/ravine next to the cleared turf playfield. Runoff leaves the site there by sheet and shallow flow. Drainage leaves the eastern portion of the site by sheet flowing into an existing gravel road on the adjacent subdivision which drains to a ditch along the south side of SE 48th Street. Drainage for the developed site will discharge to the same locations. An existing culvert crosses underneath SE 48th Street from the north side and discharges stormwater at the northwest corner of the site. This runoff will need to be intercepted and bypassed around construction as needed.
After grading, completed areas will be covered with either base rock (for installation of HMA and concrete final surfacing) or topsoil in preparation for seeding and planting. Steep slope areas will be further protected by blankets or plastic.

The following summarizes details regarding site areas:

- Total site area: 6.82 acres
- Percent impervious area before construction: ~9 %
- Percent impervious area after construction: ~22 %
- Disturbed area during construction: 3.22 acres
- Disturbed area that is characterized as impervious (i.e., access roads, staging, parking): ~0.4 acres
- 2-year stormwater runoff peak flow prior to construction (existing): 0.66 cfs
- 10-year stormwater runoff peak flow prior to construction (existing): 1.12 cfs
- 2-year stormwater runoff peak flow during construction: 0.56 cfs
- 10-year stormwater runoff peak flow during construction: 0.95 cfs
- 2-year stormwater runoff peak flow after construction: 0.61 cfs
- 10-year stormwater runoff peak flow after construction: 1.02 cfs

All stormwater flow calculations are provided in Appendix F.

3.0 Construction Stormwater BMPs

3.1 The 12 BMP Elements

3.1.1 Element #1 – Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible. The BMPs relevant to marking the clearing limits that will be applied for this project include:

- Preserving Natural Vegetation (BMP C101)
- Buffer Zones (BMP C102)
- Stake and Wire Fence (BMP C104)
- Orange Silt Fence
- Tree Protection Fence

Alternate BMPs for marking clearing limits are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.2 Element #2 – Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, and wheel washing, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters. All wash wastewater shall be controlled on site. The specific BMPs related to establishing construction access that will be used on this project include:

- Stabilized Construction Entrance (BMP C105)

- Wheel Wash (BMP C106)
- Construction Road/Parking Area Stabilization (BMP C107)

Alternate construction access BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.3 Element #3 – Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. The specific BMPs for flow control that shall be used on this project include:

- Sediment Trap (BMP C240)

Alternate flow control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, the project must comply with Minimum Requirement 7 (Ecology 2005).

In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

3.1.4 Element #4 – Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site or prior to being discharged to an infiltration facility. The specific BMPs to be used for controlling sediment on this project include:

- Silt Fence (BMP C233)
- Vegetated Strip (BMP C234)
- Straw Wattles (BMP C235)
- Sediment Trap (BMP C240)
- Storm Drain Inlet Protection (BMP C220)
- Portable Water Storage Tanks (e.g., Baker Tank) for Sedimentation.
- Materials on Hand (BMP C150) may also be applicable
- Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)

Alternate sediment control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize washoff of sediments from adjacent streets in runoff.

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 5, page 4-102).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or biofiltration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be restabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

The following BMPs will be implemented as end-of-pipe sediment controls as required to meet permitted turbidity limits in the site discharge(s). Prior to the implementation of these technologies, sediment sources and erosion control and soil stabilization BMP efforts will be maximized to reduce the need for end-of-pipe sedimentation controls.

- Temporary Sediment Pond (BMP C241)
- Construction Stormwater Filtration (BMP C251)
- Construction Stormwater Chemical Treatment (BMP C 250) (implemented only with prior written approval from Ecology).

3.1.5 Element #5 – Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)
- Nets and Blankets (BMP C122)
- Plastic Covering (BMP C123)
- Sodding (BMP C124)
- Topsoiling (BMP C125)
- Surface Roughening (BMP C130)
- Dust Control (BMP C140)
- Early application of gravel base on areas to be paved
- Materials on Hand (BMP C150) may also be applicable.
- Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)

Alternate soil stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the

NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

3.1.6 Element #6 – Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

- Temporary and Permanent Seeding (BMP C120)
- Surface Roughening (BMP C130))
- Interceptor Dike and Swale (BMP C200)
- Channel Lining (BMP C202)
- Level Spreader (BMP C206)
- Check Dams (BMP C207)
- Triangular Silt Dike (Geotextile-Encased Check Dam; BMP C208)
- Straw Wattles (BMP C235)
- Materials on Hand (BMP C150)

Alternate slope protection BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix

D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.7 Element #7 – Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site. The following inlet protection measures will be applied on this project:

Drop Inlet Protection

- Excavated Drop Inlet Protection
- Block and Gravel Drop Inlet Protection
- Gravel and Wire Drop Inlet Protection
- Catch Basin Filters
- Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)

Curb Inlet Protection: use wattles or sand bags around opening of inlet prevent sediment from entering the catch basin.

If the BMP options listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D), or if no BMPs are listed above but deemed necessary during construction, the Certified Erosion and Sediment Control Lead shall implement one or more of the alternative BMP inlet protection options listed in Appendix C.

3.1.8 Element #8 – Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels, or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion. The specific BMPs for channel and outlet stabilization that shall be used on this project include:

- Grass-Lined Channels (BMP C201)
- Channel Lining (BMP C202)
- Level Spreader (BMP C206)
- Check Dams (BMP C207)
- Materials on Hand (BMP C150)

Alternate channel and outlet stabilization BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

The project site is located west of the Cascade Mountain Crest. As such, all temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

3.1.9 Element #9 – Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

- All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.
- On-site fueling tanks and petroleum product storage containers shall include secondary containment.

- Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.

- In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

- Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

- Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2005

- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application procedures and rates shall be followed.

Demolition:

- Dust released from demolished sidewalks, buildings, or structures will be controlled using Dust Control measures (BMP C140).

- Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using Storm Drain Inlet Protection (BMP C220 as described above for Element 7).

- Process water and slurry resulting from sawcutting and surfacing operations will be prevented from entering the waters of the State by implementing Sawcutting and Surfacing Pollution Prevention measures (BMP C152).

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

Sanitary wastewater:

- Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.
- Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system or to the sanitary sewer as part of Wheel Wash implementation (BMP C106).

Solid Waste:

- Solid waste will be stored in secure, clearly marked containers.

The facility requires a Spill Prevention, Control, and Countermeasure (SPCC) Plan under the Federal regulations of the Clean Water Act (CWA).

3.1.10 Element #10 – Control Dewatering

All dewatering water from open cut excavation, tunneling, foundation work, trench, or underground vaults shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond. Channels will be stabilized, per Element #8. Clean, non-turbid dewatering water will not be routed through stormwater sediment ponds, and will be discharged to systems tributary to the receiving waters of the State in a manner that does not cause erosion, flooding, or a violation of State water quality standards in the receiving water. Highly turbid dewatering water from soils known or suspected to be contaminated, or from use of construction equipment, will require additional monitoring and treatment as required for the specific pollutants based on the receiving waters into which the discharge is occurring. Such monitoring is the responsibility of the contractor.

However, the dewatering of soils known to be free of contamination will trigger BMPs to trap sediment and reduce turbidity. At a minimum, geotextile fabric socks/bags/cells will be used to filter this material. Other BMPs to be used for sediment trapping and turbidity reduction include the following:

- Concrete Handling (BMP C151)
- Use of a sedimentation bag, with outfall to a ditch or swale for small volumes of localized dewatering.
- Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)

Alternate dewatering control BMPs are included in Appendix C as a quick reference tool for the onsite inspector in the event the BMP(s) listed above are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the General NPDES Permit (Appendix D). To avoid potential erosion and sediment control issues that may cause a violation(s) of the NPDES Construction Stormwater permit (as provided in Appendix D), the Certified Erosion and Sediment Control Lead will promptly initiate the implementation of one or more of the alternative BMPs listed in Appendix C after the first sign that existing BMPs are ineffective or failing.

3.1.11 Element #11 – Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP's specifications. Visual monitoring of the BMPs will be conducted at least once every calendar week and within 24 hours of any rainfall event that causes a discharge from the site. If the site becomes inactive, and is temporarily stabilized, the inspection frequency will be reduced to once every month.

All temporary erosion and sediment control BMPs shall be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

3.1.12 Element #12 – Manage the Project

Erosion and sediment control BMPs for this project have been designed based on the following principles:

- Design the project to fit the existing topography, soils, and drainage patterns.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of the area exposed.
- Keep runoff velocities low.
- Retain sediment on site.
- Thoroughly monitor site and maintain all ESC measures.
- Schedule major earthwork during the dry season.

In addition, project management will incorporate the key components listed below:

As this project site is located west of the Cascade Mountain Crest, the project will be managed according to the following key project components:

Phasing of Construction

- The construction project is being phased to the extent practicable in order to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

- Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities during each phase of construction, per the Scheduling BMP (C 162).

□□□□□nal Work Limitations

- From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

  - Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and

  - Limitations on activities and the extent of disturbed areas; and

  - Proposed erosion and sediment control measures.

- Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance.

- The following activities are exempt from the seasonal clearing and grading limitations:

  - Routine maintenance and necessary repair of erosion and sediment control BMPs;

  - Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and

- Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Coordination with Utilities and Other Jurisdictions

- Care has been taken to coordinate with utilities, other construction projects, and the local jurisdiction in preparing this SWPPP and scheduling the construction work.

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. This person has the necessary skills to:
  - Assess the site conditions and construction activities that could impact the quality of stormwater, and
  - Assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- A Certified Erosion and Sediment Control Lead shall be on-site or on-call at all times.
- Whenever inspection and/or monitoring reveals that the BMPs identified in this SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP

- This SWPPP shall be retained on-site or within reasonable access to the site.
- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in

eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) days following the inspection.

3.2 Site Specific BMPs

Site specific BMPs are shown on the TESC Plan Sheets and Details in Appendix A. These site specific plan sheets will be updated annually.

3.3 Additional Advanced BMPs

The BMP implementation schedule will be driven by the construction schedule. The following provides a sequential list of the proposed construction schedule milestones and the corresponding BMP implementation schedule. The list contains key milestones such as wet season construction.

The BMP implementation schedule listed below is keyed to proposed phases of the construction project, and reflects differences in BMP installations and inspections that relate to wet season construction. The project site is located west of the Cascade Mountain Crest. As such, the dry season is considered to be from May 1 to September 30 and the wet season is considered to be from October 1 to April 30.

- Mobilize and store all ESC and soil stabilization products: **07**/02/15
- Install ESC measures: **07**/03/15
- Install stabilized construction entrance: **07**/04/15
- Begin clearing and grubbing: 07/05/15
  07/05/15

[PRECISE SCHEDULE TO BE FILLED IN BY SELECTED CONTRACTOR PRIOR TO PRE-CONSTRUCTION MEETING]

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5.0 Pollution Prevention Team

5.1 Roles and Responsibilities

The pollution prevention team consists of personnel responsible for implementation of the SWPPP, including the following:

- Certified Erosion and Sediment Control Lead (CESCL) – primary contractor contact, responsible for site inspections (BMPs, visual monitoring, sampling, etc.); to be called upon in case of failure of any ESC measures.

- Resident Engineer – For projects with engineered structures only (sediment ponds/traps, sand filters, etc.): site representative for the owner

that is the project's supervising engineer responsible for inspections and issuing instructions and drawings to the contractor's site supervisor or representative

- Emergency Ecology Contact – individual to be contacted at Ecology in case of emergency. Go to the following website to get the name and number for the Ecology contact information: http://www.ecy.wa.gov/org.html.

- Emergency Owner Contact – individual that is the site owner or representative of the site owner to be contacted in the case of an emergency.

- Non-Emergency Ecology Contact – individual that is the site owner or representative of the site owner than can be contacted if required.

- Monitoring Personnel – personnel responsible for conducting water quality monitoring; for most sites this person is also the Certified Erosion and Sediment Control Lead.

5.2 Team Members

Names and contact information for those identified as members of the pollution prevention team are provided in the following table.

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Ken Tyas	(425) 508-1935
Resident Engineer	Don Proctor	(425) 507-1991
Emergency Ecology Contact	**NW** Regional Spill	(425) 649-7000
Emergency Owner Contact	**Darren** Ludwigsen	(206) 707-6583
Non-Emergency Ecology Contact	**Clay** Keown	(360) 407-6048
Monitoring Personnel	**Ken** Tyas	(425) 508-1935

6.0 Site Inspections and Monitoring

Monitoring includes visual inspection, monitoring for water quality parameters of concern, and documentation of the inspection and monitoring findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book. This SWPPP may function as the site log book if desired, or the forms may be separated and included in a separate site log book. However, if separated, the site log book but must be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.1 Site Inspection

All BMPs will be inspected, maintained, and repaired as needed to assure continued performance of their intended function. The inspector will be a Certified Erosion and Sediment Control Lead (CESCL) per BMP C160. The name and contact information for the CESCL is provided in Section 5 of this SWPPP.

Site inspection will occur in all areas disturbed by construction activities and at all stormwater discharge points. Stormwater will be examined for the presence of suspended sediment, turbidity, discoloration, and oily sheen. The site inspector will evaluate and document the effectiveness of the installed BMPs and determine if it is necessary to repair or replace any of the BMPs to improve the quality of stormwater discharges. All maintenance and repairs will be documented in the site log book or forms provided in this document. All new BMPs or design changes will be documented in the SWPPP as soon as possible.

6.1.1 Site Inspection Frequency

Site inspections will be conducted at least once a week and within 24 hours following any discharge from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

6.1.2 Site Inspection Documentation

The site inspector will record each site inspection using the site log inspection forms provided in Appendix E. The site inspection log forms may be separated from this SWPPP document, but will be maintained on-site or within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

6.2 Stormwater Quality Monitoring

6.2.1 Turbidity Sampling

Monitoring requirements for the proposed project will include either turbidity or water transparency sampling to monitor site discharges for water quality compliance with the 2005 Construction Stormwater General Permit (Appendix D). Sampling will be conducted at all discharge points at least once per calendar week.

Turbidity or transparency monitoring will follow the analytical methodologies described in Section S4 of the 2005 Construction Stormwater General Permit (Appendix D). The key benchmark values that require action are 25 NTU for turbidity (equivalent to 32 cm transparency) and 250 NTU for turbidity (equivalent to 6 cm transparency). If the 25 NTU benchmark for turbidity (equivalent to 32 cm transparency) is exceeded, the following steps will be conducted:

1. Ensure all BMPs specified in this SWPPP are installed and functioning as intended.

2. Assess whether additional BMPs should be implemented, and document revisions to the SWPPP as necessary.

3. Sample discharge location daily until the analysis results are less than 25 NTU (turbidity) or greater than 32 cm (transparency).

If the turbidity is greater than 25 NTU (or transparency is less than 32 cm) but less than 250 NTU (transparency greater than 6 cm) for more than 3 days, additional treatment BMPs will be implemented within 24 hours of the third consecutive sample that exceeded the benchmark value. Additional treatment BMPs to be considered will include, but are not limited to, off-site treatment, infiltration, filtration and chemical treatment.

If the 250 NTU benchmark for turbidity (or less than 6 cm transparency) is exceeded at any time, the following steps will be conducted:

1. Notify Ecology by phone within 24 hours of analysis (see Section 5.0 of this SWPPP for contact information).

2. Continue daily sampling until the turbidity is less than 25 NTU (or transparency is greater than 32 cm).

3. Initiate additional treatment BMPs such as off-site treatment, infiltration, filtration and chemical treatment within 24 hours of the first 250 NTU exceedance.

4. Implement additional treatment BMPs as soon as possible, but within 7 days of the first 250 NTU exceedance.

5. Describe inspection results and remedial actions taken in the site log book and in monthly discharge monitoring reports as described in Section 7.0 of this SWPPP.

7.0 Reporting and Recordkeeping

7.1 Recordkeeping

7.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and,
- Stormwater quality monitoring.

For convenience, the inspection form and water quality monitoring forms included in this SWPPP include the required information for the site log book.

7.1.2 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C.

7.1.3 Access to Plans and Records

The SWPPP, General Permit, Notice of Authorization letter, and Site Log Book will be retained on site or within reasonable access to the site and will be made immediately available upon request to Ecology or the local jurisdiction. A copy of this SWPPP will be provided to Ecology within 14 days of receipt of a written request for the SWPPP from Ecology. Any other information requested by Ecology will be submitted within a reasonable time. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with permit condition S5.G.

7.1.4 Updating the SWPPP

In accordance with Conditions S3, S4.B, and S9.B.3 of the General Permit, this SWPPP will be modified if the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site or there has been a change in design, construction, operation, or maintenance at the site that has a significant effect on the discharge, or potential for discharge, of pollutants to the waters of the State. The SWPPP will be modified within seven days of determination based on inspection(s) that additional or modified BMPs are necessary to correct problems identified, and an updated timeline for BMP implementation will be prepared.

7.2 Reporting

7.2.1 Discharge Monitoring Reports

Water quality sampling results will be submitted to Ecology monthly on Discharge Monitoring Report (DMR) forms in accordance with permit condition S5.B. If there was no discharge during a given monitoring period, the form will be submitted with the words "no discharge" entered in place of the monitoring results. If a benchmark was exceeded, a brief summary of inspection results and remedial actions taken will be included. If sampling could not be performed during a monitoring period, a DMR will be submitted with an explanation of why sampling could not be performed.

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and it causes a threat to human health or the environment, the following steps will be taken in accordance with permit section S5.F:

1. Ecology will be immediately notified of the failure to comply.

2. Immediate action will be taken to control the noncompliance issue and to correct the problem. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.

3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Any time turbidity sampling indicates turbidity is 250 nephelometric turbidity units (NTU) or greater or water transparency is 6 centimeters or less, the Ecology regional office will be notified by phone within 24 hours of analysis as required by permit condition S5.A (see Section 5.0 of this SWPPP for contact information).

In accordance with permit condition S4.F.6.b, the Ecology regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water (see Section 5.0 of this SWPPP for contact information).

7.2.3 Permit Application and Changes

In accordance with permit condition S2.A, a complete application form will be submitted to Ecology and the appropriate local jurisdiction (if applicable) to be covered by the General Permit.

Appendix A – Site Plans

Appendix B – Construction BMPs

Preserving Natural Vegetation (BMP C101)

Buffer Zones (BMP C102)

Stake and Wire Fence (BMP C104)

Stabilized Construction Entrance (BMP C105)

Wheel Wash (BMP C106)

Construction Road/Parking Area Stabilization (BMP C107)

Sediment Trap (BMP C240)

Silt Fence (BMP C233)

Vegetated Strip (BMP C234)

Straw Wattles (BMP C235)

Sediment Trap (BMP C240)

Storm Drain Inlet Protection (BMP C220)

Portable Water Storage Tanks (e.g., Baker Tank) for Sedimentation.

Materials on Hand (BMP C150) may also be applicable

Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)Temporary and Permanent Seeding (BMP C120)

Mulching (BMP C121)

Nets and Blankets (BMP C122)

Plastic Covering (BMP C123)

Sodding (BMP C124)

Topsoiling (BMP C125)

Surface Roughening (BMP C130)

Dust Control (BMP C140)

Early application of gravel base on areas to be paved

Materials on Hand (BMP C150) may also be applicable.

Alternative BMP not included in the SWMMWW (2005) or SWMMEW (2004)Temporary and Permanent Seeding (BMP C120)

Surface Roughening (BMP C130))

Interceptor Dike and Swale (BMP C200)

Channel Lining (BMP C202)

Level Spreader (BMP C206)

Check Dams (BMP C207)

Triangular Silt Dike (Geotextile-Encased Check Dam; BMP C208)

Straw Wattles (BMP C235)

Materials on Hand (BMP C150)

Grass-Lined Channels (BMP C201)

Channel Lining (BMP C202)

Check Dams (BMP C207)

Outlet Protection (BMP C209)

Appendix C – Alternative BMPs

The following includes a list of possible alternative BMPs for each of the 12 elements not described in the main SWPPP text. This list can be referenced in the event a BMP for a specific element is not functioning as designed and an alternative BMP needs to be implemented.

Element #1 - Mark Clearing Limits

Element #2 - Establish Construction Access

Element #3 - Control Flow Rates

Element #4 - Install Sediment Controls

Advanced BMPs:

Element #5 - Stabilize Soils

Element #6 - Protect Slopes

Element #8 - Stabilize Channels and Outlets

Element #10 - Control Dewatering

Additional Advanced BMPs to Control Dewatering:

Appendix D – General Permit

Appendix E – Site Inspection Forms (and Site Log)

The results of each inspection shall be summarized in an inspection report or checklist that is entered into or attached to the site log book. It is suggested that the inspection report or checklist be included in this appendix to keep monitoring and inspection information in one document, but this is optional. However, it is mandatory that this SWPPP and the site inspection forms be kept onsite at all times during construction, and that inspections be performed and documented as outlined below.

At a minimum, each inspection report or checklist shall include:

a. Inspection date/times

b. Weather information: general conditions during inspection, approximate amount of precipitation since the last inspection, and approximate amount of precipitation within the last 24 hours.

c. A summary or list of all BMPs that have been implemented, including observations of all erosion/sediment control structures or practices.

d. The following shall be noted:

i. locations of BMPs inspected,

ii. locations of BMPs that need maintenance,

iii. the reason maintenance is needed,

iv. locations of BMPs that failed to operate as designed or intended, and

v. locations where additional or different BMPs are needed, and the reason(s) why

e. A description of stormwater discharged from the site. The presence of suspended sediment, turbid water, discoloration, and/or oil sheen shall be noted, as applicable.

f. A description of any water quality monitoring performed during inspection, and the results of that monitoring.

g. General comments and notes, including a brief description of any BMP r repairs, maintenance or installations made as a result of the inspection.

h. A statement that, in the judgment of the person conducting the site inspection, the site is either in compliance or out of compliance with the terms and conditions of the SWPPP and the NPDES permit. If the site inspection indicates that the site is out of

compliance, the inspection report shall include a summary of the remedial actions required to bring the site back into compliance, as well as a schedule of implementation.

i. Name, title, and signature of person conducting the site inspection; and the following statement: "I certify under penalty of law that this report is true, accurate, and complete, to the best of my knowledge and belief".

When the site inspection indicates that the site is not in compliance with any terms and conditions of the NPDES permit, the Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

Site Inspection Form

General Information			
Project Name:			
Inspector Name:		**Title:** **CESCL # :**	
Date:		**Time:**	
Inspection Type:	□ After a rain event □ Weekly □ Turbidity/transparency benchmark exceedance □ Other		
Weather			
Precipitation	Since last inspection	In last 24 hours	
Description of General Site Conditions:			

Inspection of BMPs							
Element 1: Mark Clearing Limits							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
Element 2: Establish Construction Access							
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	
BMP:							
Location	Inspected			Functioning			Problem/Corrective Action
	Y	N		Y	N	NIP	

Element 3: Control Flow Rates

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 4: Install Sediment Controls

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:

Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 5: Stabilize Soils						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 6: Protect Slopes						
BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

BMP:						
Location	Inspected		Functioning			Problem/Corrective Action
	Y	N	Y	N	NIP	

Element 7: Protect Drain Inlets								
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
Element 8: Stabilize Channels and Outlets								
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		

Element 9: Control Pollutants								
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		

Element 10: Control Dewatering								
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		
BMP:								
Location	Inspected			Functioning			Problem/Corrective Action	
	Y	N		Y	N	NIP		

Stormwater Discharges From the Site			
	Observed?		Problem/Corrective Action
	Y	N	
Location			
Turbidity			
Discoloration			
Sheen			
Location			
Turbidity			
Discoloration			
Sheen			

Water Quality Monitoring
Was any water quality monitoring conducted? □ Yes □ No If water quality monitoring was conducted, record results here:
If water quality monitoring indicated turbidity 250 NTU or greater; or transparency 6 cm or less, was Ecology notified by phone within 24 hrs? □ Yes □ No
If Ecology was notified, indicate the date, time, contact name and phone number below: Date: Time: Contact Name: Phone #:
General Comments and Notes Include BMP repairs, maintenance, or installations made as a result of the inspection.
Were Photos Taken? □ Yes □ No If photos taken, describe photos below:

Appendix F – Engineering Calculations

10. Bond Quantities, Facility Summaries, and Declaration of Covenant

A Bond Quantities Worksheet, Facility Summaries, and Declaration of Covenant will be prepared with the final version of the project Stormwater Management Report that will be submitted to and reviewed by the City of Issaquah.

11. Operation and Maintenance Manual

Operation and Maintenance Cut sheet from the KCSWDM are included in this section.

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Tank or Vault Storage Area	Trash and debris	Any trash and debris accumulated in vault or tank (includes floatables and non-floatables).	No trash or debris in vault.
	Sediment accumulation	Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than ½ length of tank.	All sediment removed from storage area.
Tank Structure	Plugged air vent	Any blockage of the vent.	Tank or vault freely vents.
	Tank bent out of shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape.	Tank repaired or replaced to design.
	Gaps between sections, damaged joints or cracks or tears in wall	A gap wider than ½-inch at the joint of any tank sections or any evidence of soil particles entering the tank at a joint or through a wall.	No water or soil entering tank through joints or walls.
Vault Structure	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch, any evidence of soil entering the structure through cracks or qualified inspection personnel determines that the vault is not structurally sound.	Vault is sealed and structurally sound.
Inlet/Outlet Pipes	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 3 – DETENTION TANKS AND VAULTS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Access Manhole	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open manhole requires immediate maintenance.**	Manhole access covered.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift.	Cover/lid can be removed and reinstalled by one maintenance person.
	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Large access doors/plate	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can opened as designed.
	Gaps, doesn't cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and covers access opening completely.
	Lifting Rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.

NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the structure opening or is blocking capacity of the structure by more than 10%.	No Trash or debris blocking or potentially blocking entrance to structure.
		Trash or debris in the structure that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the structure.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Sediment	Sediment exceeds 60% of the depth from the bottom of the structure to the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section or is within 6 inches of the invert of the lowest pipe into or out of the structure or the bottom of the FROP-T section.	Sump of structure contains no sediment.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering structure through cracks, or maintenance person judges that structure is unsound.	Structure is sealed and structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering structure through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Structure has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Ladder rungs missing or unsafe	Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
FROP-T Section	Damage	T section is not securely attached to structure wall and outlet pipe structure should support at least 1,000 lbs of up or down pressure.	T section securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight or show signs of deteriorated grout.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes—other than designed holes—in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or missing	Cleanout gate is missing.	Replace cleanout gate.

NO. 4 – CONTROL STRUCTURE/FLOW RESTRICTOR

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		Cleanout gate is not watertight.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
Orifice Plate	Damaged or missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
	Deformed or damaged lip	Lip of overflow pipe is bent or deformed.	Overflow pipe does not allow overflow at an elevation lower than design
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.
Metal Grates (If Applicable)	Unsafe grate opening	Grate with opening wider than $^{7}/_{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris. footnote to guidelines for disposal
	Damaged or missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance.**	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $^{7}/_{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris. footnote to guidelines for disposal
	Damaged or missing	Grate missing or broken member(s) of the grate. **Any open structure requires urgent maintenance.**	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance.**	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 6 – CONVEYANCE PIPES AND DITCHES

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

NO. 8 – ENERGY DISSIPATERS

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed.
Site	Trash and debris	Trash and/or debris accumulation.	Dissipater clear of trash and/or debris.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Rock Pad	Missing or moved Rock	Only one layer of rock exists above native soil in area five square feet or larger or any exposure of native soil.	Rock pad prevents erosion.
Dispersion Trench	Pipe plugged with sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not discharging water properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench).	Water discharges from feature by sheet flow.
	Perforations plugged.	Over 1/4 of perforations in pipe are plugged with debris or sediment.	Perforations freely discharge flow.
	Water flows out top of "distributor" catch basin.	Water flows out of distributor catch basin during any storm less than the design storm.	No flow discharges from distributor catch basin.
	Receiving area over-saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Gabions	Damaged mesh	Mesh of gabion broken, twisted or deformed so structure is weakened or rock may fall out.	Mesh is intact, no rock missing.
	Corrosion	Gabion mesh shows corrosion through more than ¼ of its gage.	All gabion mesh capable of containing rock and retaining designed form.
	Collapsed or deformed baskets	Gabion basket shape deformed due to any cause.	All gabion baskets intact, structure stands as designed.
	Missing rock	Any rock missing that could cause gabion to loose structural integrity.	No rock missing.
Manhole/Chamber	Worn or damaged post, baffles or side of chamber	Structure dissipating flow deteriorates to ½ or original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure is in no danger of failing.
	Damage to wall, frame, bottom, and/or top slab	Cracks wider than ½-inch or any evidence of soil entering the structure through cracks, or maintenance inspection personnel determines that the structure is not structurally sound.	Manhole/chamber is sealed and structurally sound.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the structure at the joint of the inlet/outlet pipes.	No soil or water enters and no water discharges at the joint of inlet/outlet pipes.

NO. 11 – GROUNDS (LANDSCAPING)

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. **A hazard tree identified by a qualified arborist must be removed as soon as possible.**	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

NO. 12 – ACCESS ROADS

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can).	Roadway drivable by maintenance vehicles.
		Debris which could damage vehicle tires or prohibit use of road.	Roadway drivable by maintenance vehicles.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Blocked roadway	Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
		Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.	At least 12-foot of width on access road.
Road Surface	Erosion, settlement, potholes, soft spots, ruts	Any surface defect which hinders or prevents maintenance access.	Road drivable by maintenance vehicles.
	Vegetation on road surface	Trees or other vegetation prevent access to facility by maintenance vehicles.	Maintenance vehicles can access facility.
Shoulders and Ditches	Erosion	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.
Modular Grid Pavement	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damaged or missing	Access surface compacted because of broken on missing modular block.	Access road surface restored so road infiltrates.

NO. 21 – STORMFILTER (CARTRIDGE TYPE)

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash and debris	Any trash or debris which impairs the function of the facility.	Trash and debris removed from facility.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oils, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Life cycle	System has not been inspected for three years.	Facility is re-inspected and any needed maintenance performed.
Vault Treatment Area	Sediment on vault floor	Greater than 2 inches of sediment.	Vault is free of sediment.
	Sediment on top of cartridges	Greater than ½ inch of sediment.	Vault is free of sediment.
	Multiple scum lines above top of cartridges	Thick or multiple scum lines above top of cartridges. Probably due to plugged canisters or underdrain manifold.	Cause of plugging corrected, canisters replaced if necessary.
Vault Structure	Damage to wall, Frame, Bottom, and/or Top Slab	Cracks wider than ½-inch and any evidence of soil particles entering the structure through the cracks, or qualified inspection personnel determines the vault is not structurally sound.	Vault replaced or repaired to design specifications.
	Baffles damaged	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Repair or replace baffles to specification.
Filter Media	Standing water in vault	9 inches or greater of static water in the vault for more than 24 hours following a rain event and/or overflow occurs frequently. Probably due to plugged filter media, underdrain or outlet pipe.	No standing water in vault 24 hours after a rain event.
	Short circuiting	Flows do not properly enter filter cartridges.	Flows go through filter media.
Underdrains and Clean-Outs	Sediment/debris	Underdrains or clean-outs partially plugged or filled with sediment and/or debris.	Underdrains and clean-outs free of sediment and debris.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.
Access Manhole	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open manhole requires immediate maintenance.**	Manhole access covered.
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to remove	One maintenance person cannot remove cover/lid after applying 80 lbs of lift.	Cover/lid can be removed and reinstalled by one maintenance person.
	Ladder rungs unsafe	Missing rungs, misalignment, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Large access doors/plate	Damaged or difficult to open	Large access doors or plates cannot be opened/removed using normal equipment.	Replace or repair access door so it can opened as designed.

NO. 21 – STORMFILTER (CARTRIDGE TYPE)

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Gaps, doesn't cover completely	Large access doors not flat and/or access opening not completely covered.	Doors close flat and cover access opening completely.
	Lifting Rings missing, rusted	Lifting rings not capable of lifting weight of door or plate.	Lifting rings sufficient to lift or remove door or plate.